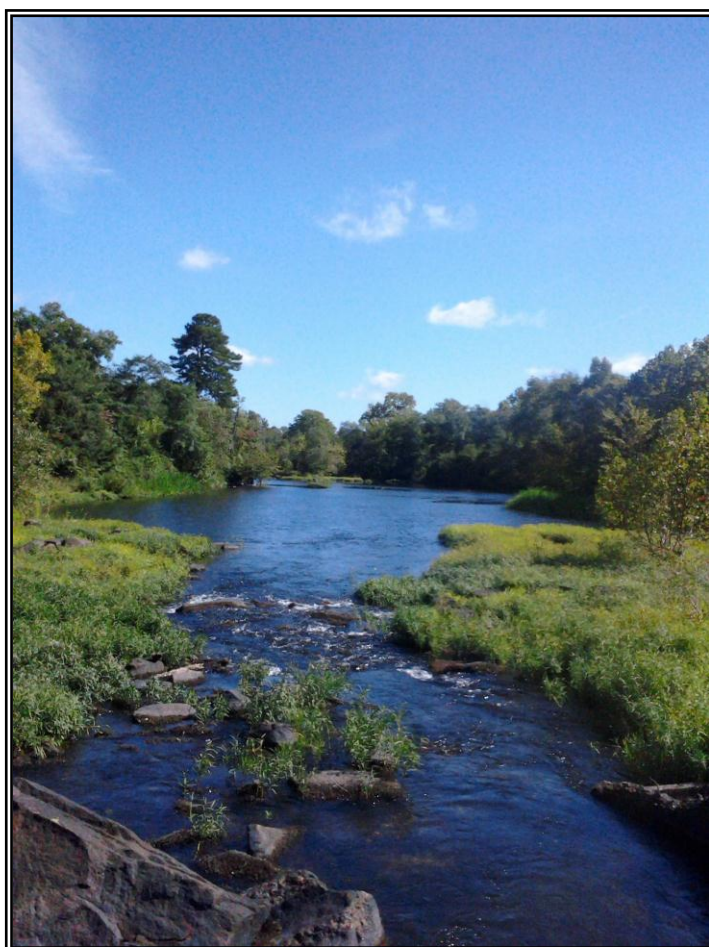
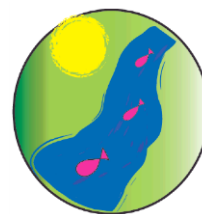




2014 Chesterfield WaterTrends Report of the Quality of Select Streams, Rivers and Lakes in Chesterfield County, Virginia



The Appomattox River near Ettrick, Virginia

**Chesterfield County
Department of Environmental Engineering
Water Quality Section
March 2015**

Executive Summary

In 2014, volunteer monitors conducted water quality investigations at thirty-three stream and river stations and two lake stations in the County. There were 335 individual surveys conducted by 39 volunteer monitors, representing a total of 479.2 hours of effort. A basic suite of parameters was measured at each site including pH, dissolved oxygen, water temperature and clarity. Water depth was recorded at fifteen stream and river reaches and at one lake site. Ambient air temperature was noted at all sites. *E. coli* concentrations were measured at nine sites during 2014. Observations of general water conditions, coloration, odors, debris present, plants and wildlife were also recorded.

As in past years, most annual medians of pH, dissolved oxygen and surface water temperature met VA DEQ surface water standards. Observations of pH indicated that most measurements made during 2013 fell within the acceptable 6.0 to 9.0 units range specified by the VA DEQ. There were three observations of pH that fell below the VA DEQ acceptable range. These were at Station 11, a tributary to Powhite Creek and Station 12, Johnson Creek. The low pH reading at Station 11 might have been preceded by a day of heavy storms and accompanied by elevated flows and reduced clarity. Station 12, Johnson Creek is currently listed as impaired for pH by VA DEQ.

Dissolved oxygen concentrations indicated adequate to well-oxygenated waters at most sites during 2014. There were six measurements at two stations that did not meet the minimum 4.0 mg/L VA DEQ standard for adequate oxygen. The majority (five) of these were at Station 15 on Winterpock Creek, which had persistent low dissolved oxygen concentrations. Winterpock Creek listed by the state as a naturally impaired waterway for dissolved oxygen. In general, the majority of the low dissolved oxygen concentrations noted among the sites monitored typically occurred during the warmer summer months.

Monthly median temperatures and individual measurements varied normally according to season. There were no surveys conducted in 2014 that reported water temperatures exceeding the state standard of 32.0°C.

Water clarity was measured with a 120-centimeter turbidity tube (stream and river stations) or by a standard eight-inch Secchi disk at the James River at Enon Park and the Walton Lake stations. The greatest annual median transparencies of ≥ 120.0 centimeters were observed at eleven stations during 2014. The lowest annual median transparency among all sites was noted at Station 31, a tributary to Pocoshock Creek at A.M. Davis Elementary School. Its median transparency in 2014 was 43.0 centimeters.

In 2014, *E. coli* monitoring using the Coliscan Easygel method was conducted at seven sites to characterize ambient bacteria levels. The monitoring period medians observed at these stations ranged from <20 CFU/100ml at multiple reaches to 620 CFU/100ml at Station 6, Spring Run at Bird Song Road. There were five individual measurements made at three sites in 2014 that exceeded the 235 CFU/100ml state bacterial standard for recreational contact. Station 6 reported four of these violations.

Most surveys were conducted on sunny/clear days and partly cloudy/overcast days during normal baseflow or calm conditions. As noted in past reports, the majority of the observations recorded in 2014 indicated a light to dark brown color present in the monitored waters. Odors were infrequently recorded and when noted they were usually described as earthy. Leaves and debris were noted frequently in the fall. A variety of wildlife was observed during the year to include numerous aquatic insects, fish, frogs, turtles, songbirds and waterfowl.

Introduction

This report presents the water quality data collected by volunteer monitors in the Chesterfield WaterTrends Program. The Chesterfield WaterTrends Program began in 2008 when two separate programs were combined into one program jointly coordinated by the Department of Environmental Engineering - Water Quality Section and Friends of Chesterfield's Riverfront. In 2011, the Water Quality section became the sole administrator in the implementation of WaterTrends and currently holds the Virginia Department of Environmental Quality (VA DEQ) grant that funds the program. Chesterfield WaterTrends sites include streams, rivers and lakes. Monitors collected data on a volunteer basis to sample and measure the general state of water quality. The WaterTrends program was included as a monitoring and outreach component of Chesterfield County's VPDES Permit VA0088609 administered by the Department of Environmental Engineering - Water Quality Section.

Residents with an interest in the health of their local water body were involved in the selecting of the sites they monitored. Sites were selected based upon the presence of public access and the potential for use by the general public for recreational activities. Monitors were asked to commit to the program for a period of at least one year. After a monitor's first year in the program, he/she was required to attend an annual recertification session each subsequent year to assure quality of technique and to update operating procedures as needed. In 2014, thirty-three stream and river sites and two lake sites were monitored. Seven of the sites were monitored for *E. coli* bacteria.

Methods

A Station ID was assigned to each Chesterfield WaterTrends site. All stream and river sites were assigned a single or double-digit number. All lake sites were given a triple digit number, where the first two digits represent the lake and the last digit denotes the site on the lake. As in past years, the sampling frequency for sites in the Chesterfield WaterTrends Program varied. Lake sites were sampled on a monthly basis at multiple stations during the growing season (approximately April – November) from docks or boats. Streams and rivers were monitored year round at varying frequencies. A suite of parameters was measured at each site: pH, dissolved oxygen, water temperature and turbidity. Water depth was recorded at lake sites and at several stream and river sites. Ambient air temperature was also noted. Observations of general water conditions, water color, odors, debris, plants and wildlife were recorded as part of each site visit.

Chesterfield WaterTrends volunteers used an armored Celsius thermometer to record water and air temperature. Dissolved oxygen was measured using a modified Winkler titration field kit (LaMotte#5860) and pH was measured using a precision pH field kit (LaMotte#5858). Turbidity was measured at lakes and most river sites using a standard eight-inch diameter Secchi disk. At the majority of stream sites, a 120-centimeter turbidity tube was used to measure water clarity (turbidity). Trophic State Index values were calculated for lakes. Water depth was determined using the Secchi disk as a sounding line. When possible, duplicate measurements were made to verify readings. At

seven sites, *E. coli* levels were determined using the Coliscan Easy-Gel Kit, a method using pre-packaged sterile agar media and a five-milliliter water sample to grow bacteria on a pre-treated sterile Petri dish. Observed *E. coli* densities were expressed as Colony Forming Units per 100 milliliters (CFU/100ml).

Datasheets were completed in the field and entered into a Microsoft Excel spreadsheet by each monitor. The spreadsheets and datasheets were submitted quarterly to the Water Quality section staff. The spreadsheets were compiled and reviewed for quality control. All data was uploaded into the VA DEQ's Virginia Volunteer/Non-Agency Monitoring Database.

Station Descriptions and Data Summaries

The following pages describe each site and a summary of the data and observations made during 2014. Annual median values for each monitored parameter have been calculated and outlined in each site summary table when applicable. Associated maps depict the sampling station locations. Field sheets for each site and monitoring survey are included in Appendix A.

Station ID: 1

Site: James River at Robious Landing Park

Latitude: 37.5591

Longitude: 77.6469

Watershed: James River

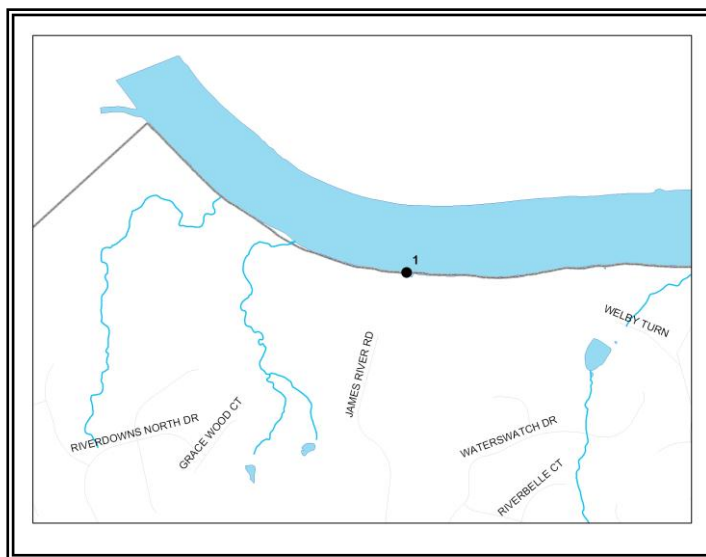
Land use: Mixed

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 18.0

Monitoring since: August 2001



This site is located on the James River in the northern portion of Chesterfield County within the Robious Landing Park. River measurements and water samples were obtained from the wooden boat dock at the park once per month. A total of twelve surveys were conducted during 2014.

Table 1-1. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	6.5	4.5	11.3	7.0	39.0	*
February	1	6.0	5.0	11.3	7.0	69.0	*
March	1	16.0	8.0	10.7	7.0	42.0	*
April	1	27.5	14.5	7.9	7.0	82.0	*
May	1	23.0	18.0	7.0	7.0	30.0	*
June	1	19.0	21.0	7.4	7.5	88.0	*
July	1	21.5	26.5	6.0	7.5	40.0	*
August	1	26.0	27.0	6.0	8.0	≥120.0	*
September	1	22.0	26.5	5.8	7.5	75.0	*
October	1	24.0	19.0	8.0	7.0	≥120.0	*
November	1	16.0	12.0	9.8	7.0	≥120.0	*
December	1	9.0	8.0	10.0	7.0	100.0	*
Minimum		6.0	4.5	5.8	7.0	30.0	*
Median		20.3	16.3	7.9	7.0	78.5	*
Maximum		27.5	27.0	11.3	8.0	≥120.0	*
2013 Annual Median		20.0	14.0	8.2	7.3	107.0	*
2012 Annual Median		18.0	15.8	8.8	7.5	≥120.0	*
2011 Annual Median		20.5	17.5	9.2	7.5	≥120.0	*
2010 Annual Median		17.0	16.5	8.6	7.5	≥120.0	*
2009 Annual Median		22.0	15.5	7.8	7.5	92.0	*
2008 Annual Median		16.0	15.5	8.2	7.5	≥120.0	*

Sampling of the James River at Robious Landing Park was conducted from January through December during 2014. Five surveys occurred on clear/sunny days and five surveys occurred on overcast or partly cloudy days. Two surveys occurred on rainy days. Normal baseflow conditions were noted on six dates, high/elevated flows on two dates and low flows on four dates. Water color was recorded as light brown on six of the surveys, clear on three events and turbid on one event. Water color was noted as green in July and August. Foam was also noted in August. Leaves and debris were the most often

recorded floatable observed in the water and were noted on three occasions in 2014. No perceptible odors were noted in 2014.

As in past years, water depth was not measured at this site. Monthly transparency values, as measured by turbidity tube, ranged from a low of 30.0 centimeters in February to ≥ 120.0 centimeters on three occasions. The annual median transparency value of 78.5 centimeters was lower than the previous six years. As noted during previous years' monitoring, all monthly pH values during 2014 were within the 6.0 - 9.0 units standard range set by the state. Additionally, no individual pH measurements violated the state standard during 2014. Monthly surface temperatures ranged from 4.5 to 27.0°C and varied normally with season. No individual temperature values exceeded the state standard of 32.0°C during 2014. All individual dissolved oxygen concentrations were above the state standard of 4.0 mg/L and were indicative of well-oxygenated waters. All observations in 2014 were indicative of continued excellent water quality at this site.

Station ID: 2

Site: Unnamed Tributary to Falling Creek in Rockwood Park

Latitude: 37.4542

Longitude: 77.5804

Watershed: Falling Creek

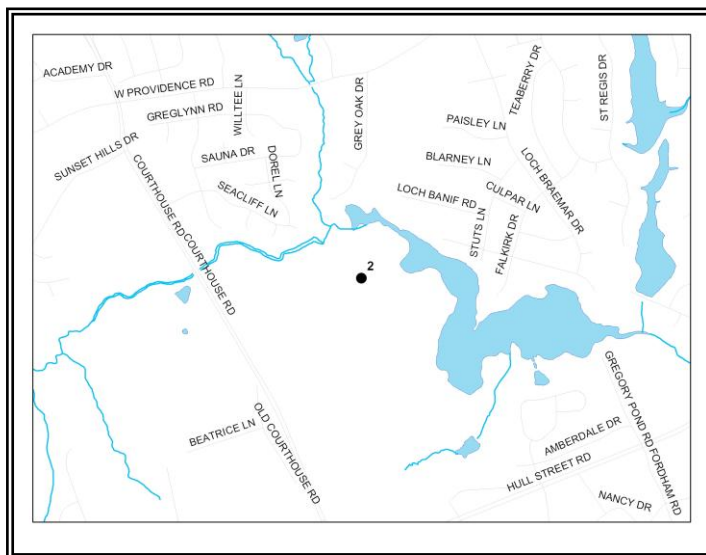
Land use: Residential, County Park

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 22.5

Monitoring since: August 2001



This site is located on an unnamed tributary to Falling Creek in the north central portion of Chesterfield County within the county's Rockwood Park. Stream measurements and water samples were obtained from the wooden footbridge one quarter of a mile past the nature center once per month from January to December. A total of nine surveys were conducted during 2014.

Table 1-2. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
April	1	16.0	15.4	6.3	6.5	118.0	0.5
May	1	24.0	19.0	6.1	6.5	112.0	0.5
June	1	18.5	22.0	5.7	6.5	26.0	0.8
July	1	19.5	21.5	4.8	6.5	86.0	0.4
August	1	21.0	21.0	5.6	6.5	≥120.0	0.4
September	1	22.0	18.0	5.9	7.0	≥120.0	0.4
October	1	3.5	10.5	7.2	6.5	102.0	0.5
November	1	-5.0	2.0	10.2	6.5	90.0	0.5
December	1	-2.5	3.0	9.4	6.5	26.0	0.5
Minimum		-5.0	2.0	4.8	6.5	26.0	0.4
Median		18.5	18.0	6.1	6.5	102.0	0.5
Maximum		24.0	22.0	10.2	7.0	≥120.0	0.8
2013 Annual Median		17.0	16.0	6.0	6.3	95.0	0.5
2012 Annual Median		19.5	16.3	6.9	6.5	72.0	0.5
2011 Annual Median		11.0	7.5	9.3	6.5	66.0	0.7
2010 Annual Median		21.0	19.0	6.0	6.5	86.8	*
2009 Annual Median		17.5	12.0	8.1	6.5	118.0	*
2008 Annual Median		22.0	16.5	7.2	6.5	90.6	*

Sampling of this unnamed tributary to Falling Creek was conducted during nine months in 2014. Seven of the monitoring events occurred during clear/sunny days, one event occurred on an overcast day and rain was noted on one day. Low or negligible flow conditions were observed August through December. High flows were reported in April and June and normal flows were reported in May and July. Water coloration was light to dark brown most of the year was noted as turbid in June. Leaves and debris were noted

during all sampling events. As in previous years, there were no perceptible odors recorded for 2014.

Water depth was measured monthly at this site with values ranging from 0.36 to 0.76 meters. Monthly transparency values ranged from a low of 26 centimeters in June to ≥ 120.0 centimeters in August and September. The annual median value of 102 centimeters was greater than the previous six years. All monthly pH values during the year were within the 6.0 - 9.0 units state standard. Monthly surface temperatures ranged from 2.0 to 22.0°C and varied normally with season. No individual values exceeded the state standard of 32.0°C during 2014. All monthly median dissolved oxygen concentrations noted during 2014 were at or above the state standard of 4.0 mg/L and were indicative of well-oxygenated waters. The annual median dissolved oxygen concentration (6.1 mg/L) was above the 4.0 mg/L threshold indicating well-oxygenated waters. Water quality measurements at this site continue to suggest very good water quality.

Station ID: 3.1

Site: Unnamed Tributary to
Falling Creek at Midlothian
Mines Park

Latitude: 37.4970

Longitude: 77.6452

Watershed: Falling Creek

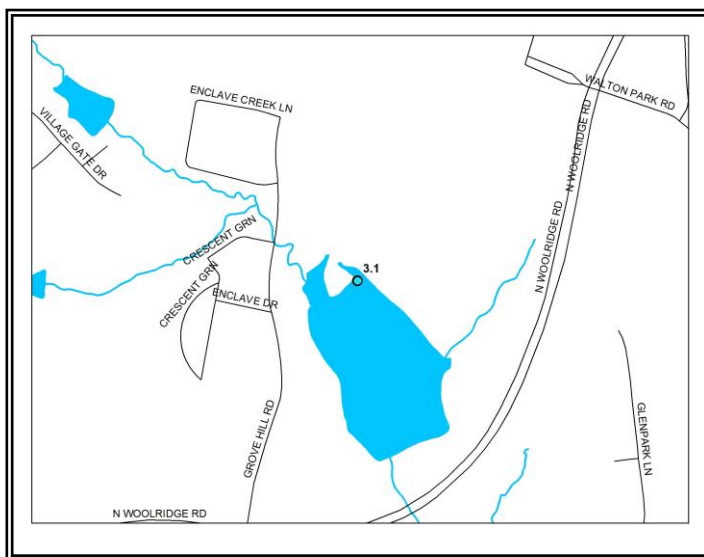
Land use: Residential,
Commercial, Park

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 23.0

Monitoring since: January 2014



This monitoring site was moved to an impoundment upstream of the previous monitoring site on an unnamed tributary to Falling Creek within the county's Midlothian Mines Park in 2014. Stream measurements and water samples were obtained from the dock located approximately 265 meters north the park parking lot on Woolridge Road. Sampling occurred once per month from January to December.

Table 1-3. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	4.0	5.0	9.7	6.5	60.0	*
February	1	20.0	10.0	9.7	6.5	70.0	*
March	1	13.0	10.0	9.3	6.5	50.0	*
April	1	15.0	17.0	9.8	7.0	100.0	*
May	1	23.0	25.0	7.1	6.5	65.0	*
June	1	22.0	26.0	6.8	6.5	45.0	*
July	1	26.0	27.0	8.0	7.0	65.0	*
August	1	25.0	26.0	7.2	6.8	≥120.0	*
September	1	17.0	20.0	7.7	6.8	≥120.0	*
October	1	30.0	21.0	8.7	8.5	≥120.0	*
November	1	23.0	14.0	12.2	9.0	75.0	*
December	1	8.0	9.0	12.2	8.5	89.0	*
	Minimum	4.0	5.0	9.7	6.5	45.0	*
	Median	21.0	18.5	9.0	6.8	72.5	*
	Maximum	30.0	27.0	12.2	9.0	≥120.0	*

Sampling was conducted at the site over twelve months during 2014. Six of the sampling events occurred during clear/sunny days, and six events occurred during rainy or overcast days. Normal or calm surface conditions were noted on eleven surveys with small waves noted in March. Water coloration was typically recorded as light brown on six events, clear on five events and green in January. Leaves and debris were noted three times. There were no perceptible odors observed during 2014.

Water depth was not measured at this site in 2014. Monthly transparency values as measured by turbidity tube ranged from a low of 45.0 centimeters in June to ≥ 120.0 centimeters August through September. The annual median transparency value was 72.5 centimeters. All monthly pH values during the 2014 were within the 6.0 - 9.0 units standard range set by the state. Monthly pH values were recorded as 9.0 in November and 8.5 in December. Although no individual pH measurements violated the state standard, Chesterfield Water Quality staff field-checked the site with a Hydrolab sonde and confirmed the pH measurements. The elevated pH and increased turbidity in November and December (75 centimeters and 89 centimeters respectively) were characteristic of the effects of an algae bloom. The median dissolved oxygen measurements during these months (12.2 mg/L each) were also suggestive of an increase in photosynthetic activity. Monthly surface temperatures ranged from 5.0 to 27.0°C and varied normally with season. No individual temperature values exceeded the state standard of 32.0°C during 2014. The annual median dissolved oxygen value was 9.0 mg/L. The high turbidity, elevated pH and elevated dissolved oxygen values in November and December were suggestive of eutrophic conditions. Chesterfield WaterTrends will explore adding additional monitoring locations to better assess the state of this waterbody.

Station ID: 4

Site: Swift Creek at Bailey Bridge Middle School

Latitude: 37.4098

Longitude: 77.6165

Watershed: Swift Creek

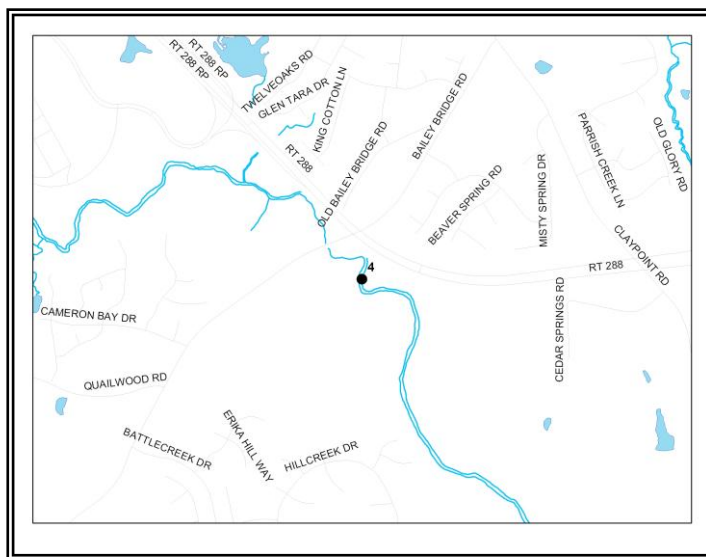
Land use: Residential, Commercial and School

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 24.5

Monitoring since: August 2001



This site is located on the mainstem of Swift Creek, one of the major waterways of Chesterfield County. The site lies just downstream of the Swift Creek Reservoir in the central portion of Chesterfield County. Stream measurements and water samples were obtained from Swift Creek downhill from the Bailey Bridge Sewage Pump Station one per month with a total of twelve surveys conducted during 2014.

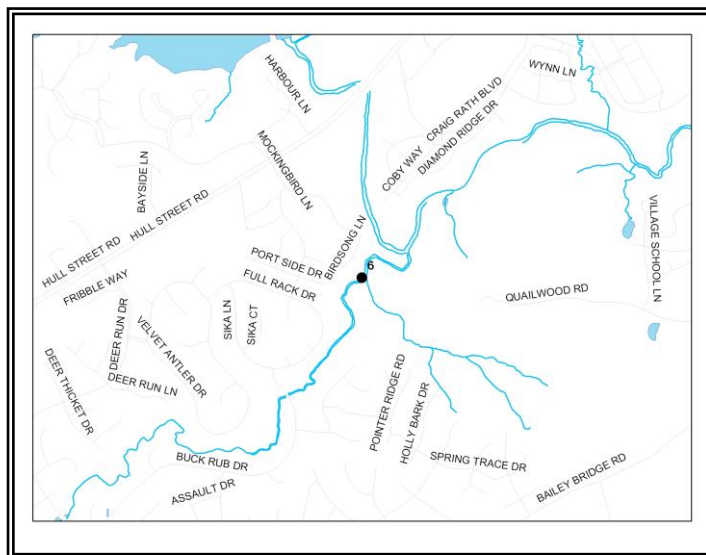
Table 1-4. Monthly values and annual medians for each water quality parameter measured during 2104.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	4.0	2.0	12.6	6.5	64.0	0.9
February	1	6.0	5.0	12.1	6.5	58.0	1.2
March	1	13.0	7.5	11.4	6.5	67.0	1.4
April	1	28.0	19.0	8.3	6.5	120.0	1.0
May	1	19.0	22.0	7.0	6.5	73.0	2.0
June	1	27.0	23.5	6.1	7.0	≥120.0	0.4
July	1	30.5	26.5	3.9	7.0	≥120.0	0.4
August	1	22.0	21.5	5.8	6.5	≥120.0	0.5
September	1	30.5	27.0	5.8	7.0	≥120.0	0.4
October	1	17.0	16.0	5.1	7.0	≥120.0	0.5
November	1	11.0	7.0	7.4	6.5	≥120.0	0.6
December	1	6.0	7.0	10.3	6.5	72.0	0.6
Minimum		4.0	2.0	3.9	6.5	58.0	0.4
Median		18.0	17.5	7.2	6.5	≥120.0	0.6
Maximum		30.5	27.0	12.6	7.0	≥120.0	2.0
2013 Annual Median		15.5	10.5	7.6	6.5	≥120.0	0.9
2012 Annual Median		21.8	18.0	6.7	6.8	≥130.0	0.7
2011 Annual Median		16.0	13.8	7.3	6.8	≥130.0	0.6
2010 Annual Median		19.0	19.0	6.2	6.5	≥130.0	0.6
2009 Annual Median		27.0	21.0	6	6.5	≥130.0	*
2008 Annual Median		23.0	19.0	7	7.0	94.0	0.6

Sampling of this Swift Creek site was conducted over a 12-month period during 2014. Four sampling events occurred during on sunny days, five occurred on partly cloudy or overcast days and three occurred during rain or light showers. High flow conditions were noted on six surveys. Normal flows were noted during four events. Two surveys recorded negligible flow conditions. Water coloration ranged from clear to light brown

with green coloration noted three times. There were no perceptible odors present during 2014.

Water depth at this site ranged from 0.38 meters to 1.98 meters with an annual median value of 0.62 meters. Monthly transparency values ranged from a low of 58.0 centimeters in December to ≥ 120.0 centimeters on seven occasions during the year. The transparency at this site was indicative of very clear waters. As noted for the previous three years, all monthly pH values during 2014 were within the 6.0 - 9.0 units state standard range. Monthly surface temperatures ranged from 2.0 to 27.0°C and varied normally with season. No individual values exceeded the state standard of 32.0°C during 2014. All median dissolved oxygen concentrations except one were at or above the minimum state standard of 4.0 mg/L. In July, the median dissolved oxygen value was 3.9 mg/L. Observations were suggestive of excellent water quality at this site.

Station ID: 6**Site:** Spring Run at Birdsong Lane**Latitude:** 37.4073**Longitude:** 77.6441**Watershed:** Swift Creek**Land use:** Residential**Number of Stations:** 1**Number of Monitors:** 2**Volunteer Hours:** 10.0**Monitoring since:** April 2008

This site is located on Spring Run in the west central area of Chesterfield County at a private residence on Birdsong Lane within the Mockingbird Hills subdivision. Stream measurements and water samples were obtained one to two times per month from January through December. Samples were not taken in November. Twelve surveys were conducted during 2014.

Table 1-5. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)	E. Coli (CFU/100ml)
January	1	8.0	8.0	12.6	7.0	57.0	*	*
February	1	6.0	5.0	12.3	7.0	50.0	*	80
March	1	16.5	10.0	12.1	7.0	85.0	*	*
April	1	17.5	15.5	10.5	6.5	≥120.0	*	20
May	1	16.0	17.0	8.3	6.5	57.0	*	260
June	1	24.5	17.0	8.1	7.0	≥120.0	*	120
July	1	28.5	22.0	6.5	7.0	≥120.0	*	160
August	1	25.5	24.0	6.9	7.0	≥120.0	*	620
September	1	26.5	24.0	6.2	7.0	≥120.0	*	500
October	2	16.5	15.8	8.0	7.0	≥120.0	*	260
December	1	4.0	7.5	10.9	7.0	≥120.0	*	80
Minimum		4.0	5.0	6.2	6.5	50.0	*	20
Median		16.5	15.8	8.3	7.0	≥120.0	*	160
Maximum		28.5	24.0	12.6	7.0	85.0	*	620
2013 Annual Median		19.5	13.3	8.3	7.0	109.8	*	100
2012 Annual Median		21.0	18.0	7.8	7.0	≥130.0	*	180
2011 Annual Median		23.0	17.5	8.3	7.0	≥130.0	*	*
2010 Annual Median		18.8	15.8	8.4	7.0	≥130.0	*	*
2009 Annual Median		26.3	20.5	7.6	7.0	≥130.0	*	*
2008 Annual Median		23.0	18.5	7.2	7.0	≥130.0	*	*

Sampling of Spring Run was conducted from January through December of 2014. Physical and chemical parameters were tested on a day separate from bacterial testing in July. All parameters were tested twice in October. No tests were performed in November.

Clear/sunny conditions were recorded on six of the sampling events. Overcast or partly cloudy conditions were observed on six surveys. Normal baseflow conditions were noted on six surveys with four low flow events and two high flow events. Clear water was

observed on eight surveys and turbid conditions were noted on four surveys. As in past years, no perceptible odors were recorded during 2014. Leaves were noted four times.

As in previous years, water depth was not measured at this site. Monthly transparency values ranged from a low of 50.0 centimeters in February to ≥ 120.0 centimeters during seven surveys. As noted in prior reports, the annual median value of ≥ 120.0 centimeters was characteristic of a continued high degree of water clarity. Monthly pH values ranged from 6.5 to 7.0 units and were well within the state standard of 6.0 - 9.0 units. The annual median of 7.0 was consistent with years past. Monthly surface temperatures ranged from 5.0°C in February to 24.0°C in August and September and varied normally with season. No individual temperature values exceeded the state standard of 32.0°C during 2014. All individual dissolved oxygen concentrations were above the state standard minimum of 4.0 mg/L and were indicative of well-oxygenated waters. The annual median measured 8.3 mg/L during 2014.

E. coli measurements were conducted ten times in 2014. Samples were incubated for approximately 24 hours at 35°C with resulting densities ranging from 20 – 620 CFU/100ml. Four individual measurements exceeded the 235CFU/100ml state bacterial standard for recreational contact. Two bacterial measurements were conducted in October resulting in a median reading of 260CFU/100ml. Water quality measurements at this site suggest fair to good water quality.

Station ID: 8**Site:** James River near Enon Park**Latitude:** 37.3631**Longitude:** 77.3091**Watershed:** James River**Land use:** Mixed**Number of Stations:** 1**Number of Monitors:** 1**Volunteer Hours:** 39.5**Monitoring since:** August 2001

This site is located on the James River in the eastern portion of Chesterfield County within the Mount Blanco subdivision. River measurements and water samples were obtained from a private dock located on Mount Blanco Road one to two times per month. A total of eighteen surveys were conducted during 2014.

Table 1-6. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Secchi Depth (m)	Water Depth (m)	E. Coli (CFU/100ml)
January	1	10.0	6.0	10.3	6.5	0.4	2.0	
February	1	8.0	6.5	9.1	6.5	0.3	1.6	20
March	2	18.5	9.5	9.8	7.5	0.7	1.8	30
April	1	22.5	18.0	8.6	7.5	0.6	2.1	
May	2	27.8	22.0	8.6	7.5	0.5	1.5	
June	2	25.0	27.5	7.2	7.5	0.5	2.0	
July	2	27.5	30.0	7.2	7.8	0.4	2.0	
August	2	31.0	29.3	7.4	7.8	0.4	1.8	
September	2	24.0	25.0	7.2	8.0	0.6	2.1	0
October	1	26.0	20.0	7.6	7.5	0.6	1.6	140
November	1	8.5	8.5	9.9	7.5	0.8	1.3	140
December	1	8.5	8.5	10.9	7.5	0.7	1.9	60
Minimum		8.0	6.0	7.2	6.5	0.3	1.3	0
Median		23.3	19.0	8.6	7.5	0.5	1.9	45
Maximum		31.0	30.0	10.9	8.0	0.8	2.1	140
2013 Annual Median		18.3	18.8	8.8	7.5	0.6	1.8	160
2012 Annual Median		19.0	18.5	9.1	7.5	0.6	1.7	140
2011 Annual Median		22.8	21.8	9.1	7.5	0.5	1.8	*
2010 Annual Median		20.0	19.3	9.0	7.5	0.6	1.9	*
2009 Annual Median		20.5	18.0	9.1	7.5	0.6	2.1	*
2008 Annual Median		21.0	19.0	8.6	7.5	0.6	2.0	*

Sampling of the James River at the Enon Park site was conducted from January through December of 2014. Most surveys (15) were conducted on partly cloudy or overcast days. Three surveys were made on days when storms or showers were recorded. Normal baseflow conditions were noted on 17 surveys. One survey noted high flow. A light brown coloration was noted in all surveys in 2014. Leaves and debris were noted on five surveys and bubbles and foam were observed in June and July. Trash was noted in May. No perceptible odors were noted during 2014.

Water depth at this station ranged from 1.30 meters in November to 2.10 meters in April. The annual median water depth was 1.85 meters, a slight increase over the 2013 median of 1.70 meters. As in past years, a Secchi disk was used at this site to measure the clarity of the river. Monthly median Secchi disk transparency values ranged from a low of 0.30 meters in February to a high of 0.80 meters in November. The annual median Secchi disk transparency value (0.53 meters) was similar to past reports. All pH values during the year were within the 6.0 - 9.0 units range as set by the state standard. The 2014 annual median pH value (7.5 units) was the same as the past six years. Monthly median surface temperatures ranged from 6.0°C to 30.0°C and varied normally with season. All dissolved oxygen concentrations were above the state standard minimum of 4.0 mg/L and were indicative of well-oxygenated waters. The annual median dissolved oxygen concentration (8.6 mg/L) was in the range of previously observed values. Seven *E. coli* measurements were made at this site from January through December 2014. Samples were incubated for approximately 48 hours at 32-35°C with resulting densities ranging from 20 – 140CFU/100ml. No samples exceeded the 235CFU/100ml state bacterial standard for recreational contact. All of the observations at this station continued to suggest generally good water quality.

Station ID: 10

Site: Unnamed Tributary to
Powhite Creek at Bon Air
Elementary School

Latitude: 37.5271

Longitude: 77.5643

Watershed: Powhite Creek

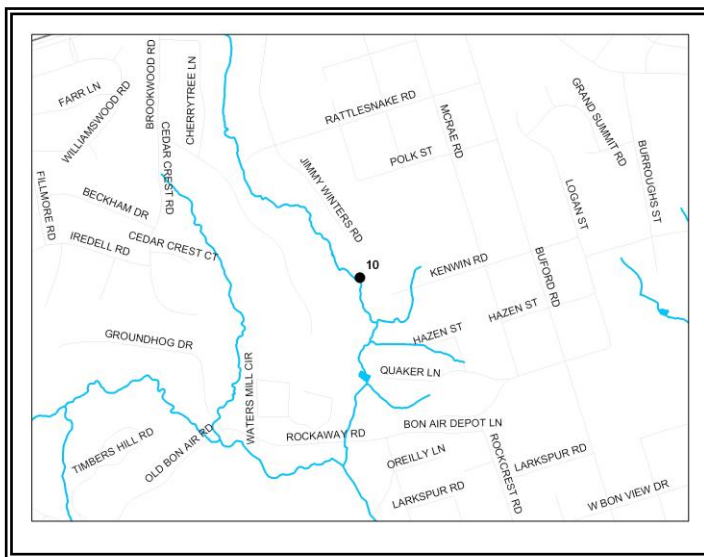
Land use: Residential, School

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 33.0

Monitoring since: July 2010



This site is located on an unnamed tributary to Powhite Creek in the northeastern area of Chesterfield County at Bon Air Elementary School. Stream measurements and water samples were obtained once per month from January to December with a total of twelve surveys conducted during 2014.

Table 1-7. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)	E. Coli (CFU/100ml)
January	1	3.5	2.0	12.3	6.5	≥120.0	1.0	20
February	1	6.5	4.5	11.7	6.5	≥120.0	1.0	20
March	1	14.5	10.5	10.7	6.5	≥120.0	1.0	40
April	1	15.0	11.5	8.1	6.5	≥120.0	1.0	80
May	1	20.5	18.0	6.9	6.5	≥120.0	0.5	40
June	1	27.0	22.5	5.5	6.5	≥120.0	0.3	20
July	1	23.5	23.5	5.9	6.5	≥120.0	1.0	260
August	1	23.5	20.0	5.6	6.0	≥120.0	0.6	100
September	1	21.5	18.0	6.3	6.5	≥120.0	0.8	160
October	1	14.5	12.5	8.2	6.5	≥120.0	0.8	120
November	1	18.0	8.0	10.3	6.5	≥120.0	0.6	0
December	1	11.5	10.0	9.3	6.5	≥120.0	0.5	20
Minimum		3.5	2.0	5.5	6.0	≥120.0	0.3	0
Median		16.5	12.0	8.1	6.5	≥120.0	0.8	40
Maximum		27.0	23.5	12.3	6.5	≥120.0	1.0	260
2013 Annual Median		17.8	13.5	8.7	6.5	≥120.0	*	80
2012 Annual Median		18.8	15.3	7.8	6.5	≥130.0	*	170
2011 Annual Median		17.0	14.0	7.2	6.5	≥130.0	*	*
2010 Annual Median		26.7	18.5	6.6	6.0	88.1	*	*

Sampling of this unnamed tributary to Powhite Creek was conducted from January through December of 2014. Seven survey events occurred during overcast or partly cloudy days and four were conducted on days when rain or storms were recorded. One survey was conducted on a clear/sunny day. Low flow conditions were recorded for six of the surveys and normal flow conditions were on four surveys. High flows were noted in February and April. Water coloration was recorded as clear on all surveys except April, which was noted as light brown. Leaves and debris were observed during all twelve visits. Algae were noted in February and March. Trash was noted in April and

July. An earthy odor was recorded in June and December. Fish were noted June through October.

Water depth was measured for the first time at this site in 2014. Monthly measurements ranged from a low of 0.30 meter to a high of 1.00 meter with an annual median of 0.80 meter. All monthly transparency values were ≥ 120.0 centimeters indicating a high degree of water clarity. All but one monthly pH values during the year equaled 6.5 units. A pH of 6.0 was recorded in August. The annual median pH was 6.5. Monthly surface temperatures ranged from 2.0 to 23.5°C and varied normally with season. No individual temperature measurements exceeded the state standard of 32.0°C during 2014. All monthly dissolved oxygen concentrations (annual median 8.1 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Twelve *E. coli* measurements were made at this site from January through December 2014. Samples were incubated for approximately 48 hours at 22°C with resulting densities ranging from <20 – 260CFU/100ml. The July sample (260cfu/100ml) exceeded the 235 CFU/100ml state bacterial standard for recreational contact. All observations made during 2014 suggested excellent water quality at this site.

Station ID: 11

Site: Unnamed Tributary to Powwhite Creek at Poplar Hollow Trail

Latitude: 37.5142

Longitude: 77.5493

Watershed: Powwhite Creek

Land use: Residential

Number of Stations: 1

Number of Monitors: 2

Volunteer Hours: 16.5

Monitoring since: January 2010



This site is located on an unnamed tributary to Powwhite Creek in the northeastern area of Chesterfield County. Stream measurements and water samples were obtained approximately once per month from January through December just north of the culvert running under Poplar Hollow Trail in the Spring Grove subdivision. A total of twelve surveys were conducted during 2014.

Table 1-8. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)	E. Coli (CFU/100ml)
January	1	15.0	8.0	10.0	6.5	≥120.0	0.1	*
February	1	23.0	13.0	9.9	6.0	≥120.0	0.1	*
March	1	23.0	13.0	9.3	6.5	≥120.0	0.2	0
April	1	21.0	15.0	8.2	5.5	43.0	0.2	120
May	1	20.0	15.0	8.5	6.0	≥120.0	0.1	0
June	1	28.0	21.0	8.4	6.0	≥120.0	0.1	100
July	1	27.5	21.0	8.0	6.0	≥120.0	0.1	60
August	1	34.0	25.0	7.6	6.5	≥120.0	0.1	20
September	1	22.0	19.0	8.2	6.5	110.0	0.93	0
October	1	24.5	16.5	7.9	6.5	≥120.0	0.1	0
November	1	15.0	10.0	8.9	6.0	≥120.0	0.1	40
December	1	16.5	9.0	9.2	6.5	≥120.0	0.0	40
Minimum		15.0	8.0	7.6	5.5	43.0	0.0	0
Median		22.5	15.0	8.5	6.3	120.0	0.1	30
Maximum		34.0	25.0	10.0	6.5	≥120.0	0.2	120
2013 Annual Median		20.5	16.5	8.3	6.3	≥120.0	0.1	60
2012 Annual Median		26.0	19.3	9.4	6.0	122.5	0.1	<20
2011 Annual Median		17.8	14.5	9.1	6.0	≥130.0	0.2	*
2010 Annual Median		22.0	15.5	8.7	6.0	≥130.0	0.3	*

Sampling of this unnamed tributary to Powwhite Creek was conducted from January through December of 2014. Clear/sunny conditions were recorded on six of the surveys. Overcast or partly cloudy conditions were noted on three surveys and storms or showers were recorded on three surveys. Normal baseflow conditions were noted on five surveys and high flows were noted four times. Low flows were noted June through August. Clear water conditions were observed on ten surveys. Clear/foamy conditions were noted in March. A milky/light brown coloration was seen in April. Leaves were noted five

times in 2013, once in January and again September through December. No perceptible odors were observed during 2013.

Water depth at this site ranged from 0.00 meter to 0.20 meter with an annual median of 0.10 meter. Monthly transparency measurements ranged from a low of 43.0 centimeters to a high of ≥ 120.0 centimeters. The annual median transparency was ≥ 120.0 centimeters. All but one monthly pH values measured during the year (annual median 6.3 units) were within the 6.0 - 9.0 units state standard range. A pH measurement of 5.5 was noted in April. Monthly median surface temperatures ranged from 8.0°C to 25.0°C and varied normally with season. No individual values exceeded the state standard of 32.0°C during 2014. All monthly dissolved oxygen concentrations were above state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters (annual median 8.5 mg/L). Ten *E. coli* measurements were made at this site during 2014. Samples were incubated for approximately 48 hours at 22°C with densities ranging from <20 to 120 CFU/100ml. None of the samples exceeded the 235 CFU/100ml state bacterial standard for recreational contact. All of the observations at this station were suggestive of continued excellent water quality.

Station ID: 12

Site: Johnson Creek at Kingston Avenue

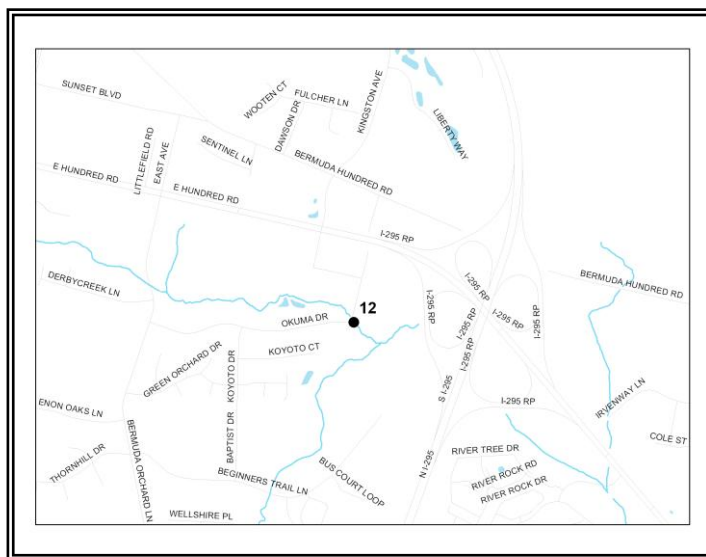
Latitude: 37.3427

Longitude: 77.3416

Watershed: Appomattox River

Land use: Residential,
Commercial

Number of Stations: 1

Number of Monitors: 1**Volunteer Hours: 21.0****Monitoring since: January 2011**

This site is located on the mainstem of Johnson Creek in the eastern area of Chesterfield County near its crossing with Kingston Avenue. Stream measurements and water samples were obtained on a monthly basis from January through December, just east of the culvert on the north bank of the stream. A total of twelve surveys were conducted during 2014.

Table 1-9. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	6.0	4.0	8.5	7.0	68.0	0.7
February	1	7.5	5.0	8.1	6.0	52.0	0.7
March	1	9.5	10.0	7.1	5.5	38.0	0.6
April	1	19.0	16.5	6.2	7.0	68.0	0.4
May	1	26.0	22.0	6.7	6.0	40.0	0.4
June	1	33.0	23.0	7.1	6.0	58.0	0.3
July	1	30.0	23.5	7.4	6.0	86.0	0.2
August	1	26.5	21.5	7.3	6.0	98.0	0.3
September	1	22.5	20.0	7.4	6.0	≥120.0	0.4
October	1	18.9	16.7	7.5	6.0	96.0	0.3
November	1	22.2	14.4	7.7	6.0	84.0	0.3
December	1	11.1	8.3	7.7	5.5	≥120.0	0.2
	Minimum	6.0	4.0	6.2	5.5	38.0	0.2
	Median	20.6	16.6	7.4	6.0	76.0	0.3
	Maximum	33.0	23.5	8.5	7.0	≥120.0	0.7
	2013 Annual Median	27.7	17.1	6.6	6.0	97.0	0.5
	2012 Annual Median	24.0	17.3	7.4	6.0	107.0	0.5
	2011 Annual Median	23.0	16.0	6.1	6.0	92.0	*

Sampling of Johnson Creek was conducted once per month from January through December of 2014. Ten surveys occurred during clear/sunny days and two were conducted on partly cloudy days. Normal baseflow conditions were noted on seven surveys, low flow conditions were noted on three surveys. High flows were noted two times. Water coloration was recorded as varying shades of brown or turbid on all surveys. Earthy odors were noted on seven surveys.

Water depth ranged from 0.20 to 0.71 meters. Monthly transparency values ranged from a low of 38.0 to ≥ 120.0 centimeters. The annual median value for transparency was 76.0 centimeters, lower than the previous year's median of 97.0 centimeters. The pH was recorded as 5.5 in March and December, which was below the 6.0 - 9.0 units state standard range. The 2014 annual median pH was 6.0 units. Monthly surface temperatures ranged from 4.0 to 23.5°C and varied normally with season. No individual values exceeded the state standard of 32.0°C during 2014. Monthly dissolved oxygen concentrations ranged from 6.2 mg/L to 8.5 mg/L with all monthly dissolved oxygen concentrations above state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. All of the observations at this station continued to suggest generally good water quality.

Station ID: 14

Site: Tributary to the James River at Old Gun Road

Latitude: 37.5543

Longitude: 77.6040

Watershed: James River

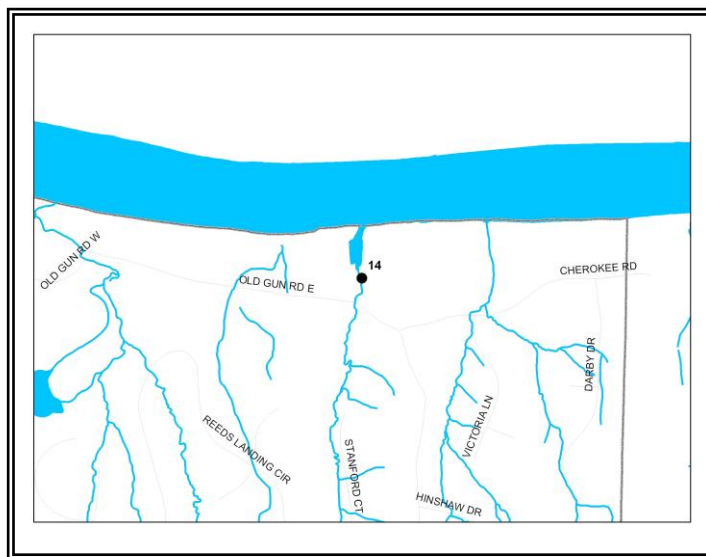
Land use: Residential

Number of Stations: 1

Number of Monitors: 2

Volunteer Hours: 23.0

Monitoring since: January 2010



This site is located on an unnamed tributary draining directly to the James River in the northern area of Chesterfield County. Water samples were obtained on a monthly basis immediately upstream of the boat slips at the Virginia Powerboat Association property. A total of twelve surveys were conducted during 2014.

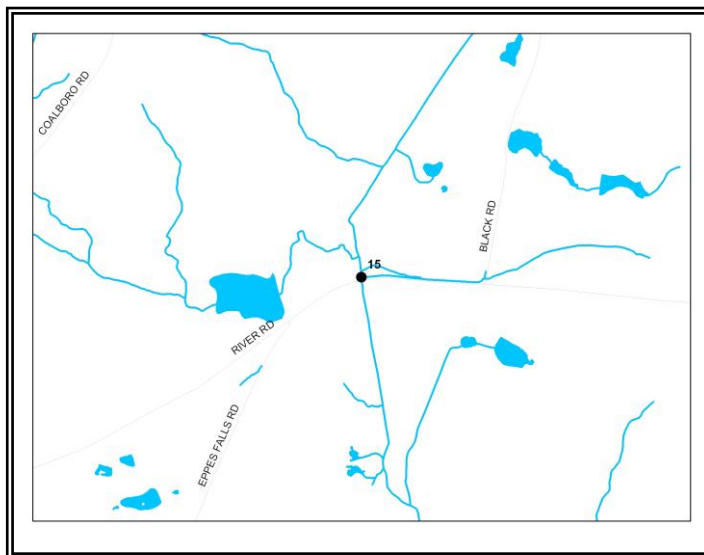
Table 1-10. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	7.0	3.0	11.5	6.5	≥120.0	*
February	1	12.0	8.0	10.0	6.5	≥120.0	*
March	1	11.0	8.0	8.8	6.5	≥120.0	*
April	1	22.0	17.0	7.8	7.0	≥120.0	*
May	1	25.0	18.0	7.0	7.0	≥120.0	*
June	1	20.0	17.0	7.1	7.0	≥120.0	*
July	1	24.0	21.0	7.1	7.0	≥120.0	*
August	1	25.0	22.0	6.7	6.5	≥120.0	*
September	1	15.0	16.0	5.8	6.5	≥120.0	*
October	1	28.0	18.0	6.9	6.5	≥120.0	*
November	1	20.0	13.0	7.9	7.0	≥120.0	*
December	1	2.0	3.0	9.7	7.0	≥120.0	*
Minimum		2.0	3.0	5.8	6.5	≥120.0	*
Median		20.0	16.5	7.5	6.8	≥120.0	*
Maximum		28.0	22.0	11.5	7.0	≥120.0	*
2013 Annual Median		19.0	14.0	7.9	6.8	≥120.0	*
2012 Annual Median		21.0	14.5	8.0	7.0	≥120.0	*
2011 Annual Median		13.0	10.0	8.8	7.0	≥130.0	*
2010 Annual Median		16.0	17.0	7.5	7.0	≥130.0	*

Sampling of this unnamed tributary to the James River was conducted from January through December of 2014. Ten survey events occurred on clear/sunny days and two were conducted on overcast or partly cloudy days. Normal baseflow conditions were noted on seven of the surveys and low flows were observed on three surveys. High flows were recorded in February and March. Clear waters were recorded on nine surveys. Light brown conditions were recorded on two surveys. Ice was noted in January. Algae,

leaves, debris and pollen were noted multiple times and were present in every season. No odors were noted in 2014.

As in previous years, water depth was not measured at this site. Monthly transparency values were noted as ≥ 120.0 centimeters on every survey during 2014, indicative of a high degree of water clarity. All monthly pH values during the year (annual median 6.8 units) were within the 6.0 - 9.0 units state standard range. Monthly median surface temperatures ranged from 3.0 to 22.0°C and varied normally with season. No individual values exceeded the state temperature standard of 32.0°C during 2014. All monthly dissolved oxygen concentrations (annual median 7.5 mg/L) were above state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. All of the observations at this station continued to suggest excellent water quality.

Station ID: 15**Site:** Winterpock Creek at River Road**Latitude:** 37.3306**Longitude:** 77.7275**Watershed:** Appomattox River**Land use:** Rural Residential**Number of Stations:** 1**Number of Monitors:** 2**Volunteer Hours:** 20.0**Monitoring since:** January 2010

This site is located on Winterpock Creek in the southwestern area of Chesterfield County where it crosses River Road. Stream measurements and water samples were obtained once or twice per month approximately six meters upstream of the bridge. A total of twelve surveys were conducted during 2014.

Table 1-11. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)	E. Coli (CFU/100ml)
January	1	8.0	1.5	9.6	6.0	≥120.0	*	*
February	1	6.0	3.5	9.8	6.0	56.0	*	*
March	1	16.0	9.0	9.6	6.0	105.0	*	40
April	1	16.0	14.0	8.1	6.0	80.0	*	0
May	1	15.0	15.5	7.0	6.5	52.0	*	180
June	1	18.0	18.5	5.2	6.5	45.0	*	40
July	1	16.0	24.0	3.2	7.0	54.0	*	20
August	1	24.0	22.5	2.8	6.5	52.0	*	0
September	1	24.5	24.0	2.4	7.0	≥120.0	*	80
October	2	16.8	16.0	2.1	6.8	62.0	*	30
December	1	6.0	6.0	7.2	6.0	≥120.0	*	60
Minimum		6.0	1.5	2.1	6.0	45.0	*	0
Median		16.0	15.5	7.0	6.5	62.0	*	40
Maximum		24.5	24.0	9.8	7.0	≥120.0	*	180
2013 Annual Median		13.5	11.5	7.0	6.0	60.0	*	15
2012 Annual Median		23.3	15.8	4.7	6.5	57.0	*	<20
2011 Annual Median		20.5	14.5	5.7	6.0	75.5	*	*
2010 Annual Median		24.1	19.0	6.4	6.5	65.3	*	*

Sampling of Winterpock Creek was conducted once or twice per month January through December of 2014. Two surveys were performed in October. No survey was performed in November. Five surveys occurred during partly cloudy or overcast days and five were conducted clear/sunny days. Rain or storms were noted on two surveys. Normal baseflow conditions were noted on four surveys and low flows were observed four times. High flows were also noted four times. Water coloration was typically turbid or light brown with two observations of clear/light brown and one observation of clear conditions in January. Leaves were noted August through December. There were no perceptible odors recorded during 2014, consistent with previous years.

As in the previous year, water depth was not measured at this site. Monthly median transparency values ranged from a low of 45.0 centimeters in June to ≥ 120.0 centimeters on three surveys. The 2014 annual median value (62.0 centimeters) was a slight increase over the 2013 median of 60.0 centimeters. All monthly pH values during the year (annual median 6.0 units) were within the 6.0 - 9.0 units state standard range. Monthly surface temperature measurements ranged from 1.5 to 24.0°C and varied normally with season. No temperature values exceeded the state maximum standard of 32.0°C during 2014. Dissolved oxygen concentrations ranged from 1.3 mg/L in October to 9.8 mg/L in March. Dissolved oxygen concentrations were below the state minimum standard of 4.0 mg/L from July to October. Winterpock Creek has been listed on the state impaired waters list for naturally occurring low dissolved oxygen since 1994. Ten *E. coli* measurements were made at this site in 2014. Samples were incubated for approximately 24 hours at 35°C with resulting densities ranging from <20 to 180 CFU/100ml. No samples exceeded the 235 CFU/100ml state bacterial standard for recreational contact. Observations from 2014 were consistent with previous years and suggest continued fair water quality at this sampling location.

Station ID: 18

Site: Falling Creek at Belmont Road

Latitude: 37.4435

Longitude: 77.5221

Watershed: Falling Creek

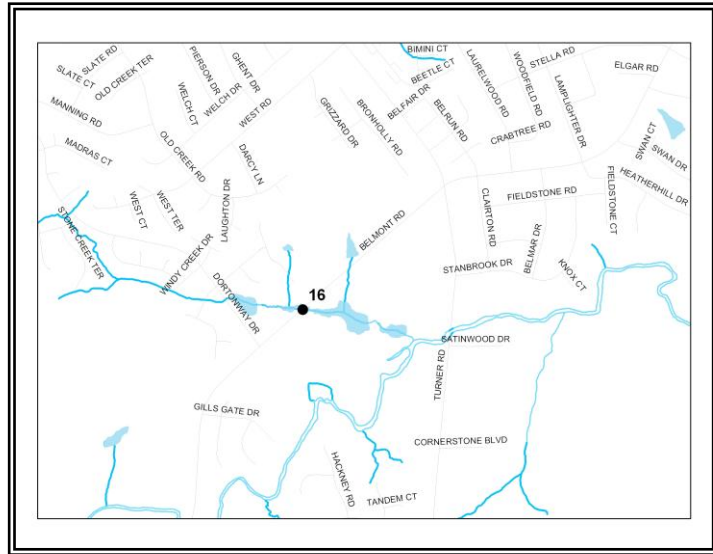
Land use: Residential

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 12.0

Monitoring since: July 2010



This site is located on the mainstem of Falling Creek, one of the major waterways of Chesterfield County. Stream measurements and water samples were obtained at the end of a residential road northwest of Belmont Road on a monthly basis from January to December. A total of twelve surveys were conducted during 2014.

Table 1-12. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	16.0	5.0	10.4	6.0	80.0	1.5
February	1	14.0	8.0	10.0	6.0	77.0	1.5
March	1	24.0	10.0	10.1	6.5	95.0	1.0
April	1	22.0	17.0	6.2	6.5	34.0	2.0
May	1	28.0	23.0	5.2	6.5	≥120.0	1.0
June	1	28.0	24.0	4.9	6.5	≥120.0	0.5
July	1	26.0	24.0	5.0	6.0	15.0	2.3
August	1	24.0	24.0	5.1	6.5	≥120.0	0.5
September	1	18.0	16.0	6.0	6.5	≥120.0	0.3
October	1	26.0	15.0	6.3	6.5	≥120.0	0.3
November	1	22.0	10.0	6.8	6.5	95.0	0.8
December	1	10.0	5.2	10.3	6.5	≥120.0	1.0
Minimum		10.0	5.0	4.9	6.0	15.0	0.3
Median		23.0	15.5	6.2	6.5	107.5	1.0
Maximum		28.0	24.0	10.4	6.5	≥120.0	2.3
2013 Annual Median		17.5	14.5	7.5	6.5	113.5	1.4
2012 Annual Median		22.5	17.0	6.7	6.5	117.5	1.2
2011 Annual Median		22.5	17.0	5.5	6.5	≥130.0	1.4
2010 Annual Median		21.0	18.5	7.9	6.8	≥130.0	0.5

Sampling at this Falling Creek site was conducted from January through December of 2014. Six surveys occurred on clear/sunny days and six surveys occurred on partly cloudy or overcast days. Low flow conditions were noted eight times and normal flows were noted three times. High flow conditions were noted in August. Water coloration was recorded as light to dark brown on most surveys. Clear conditions were noted in September and October. No floatables were noted in 2014. An earthy odor was noted in July.

Monthly transparency values ranged from a low of 15.0 centimeters in July to ≥ 120.0 centimeters on several occasions. The annual median transparency value of 107.5 centimeters continued to indicate a high degree of water clarity at this location but was the lowest since monitoring began at this location in 2010. All monthly pH values during the year (annual median 6.5 units), were within the 6.0 - 9.0 units state standard range. Monthly surface temperatures values ranged from 5.0 to 24.0°C and varied normally with season. No temperature readings exceeded the state maximum standard of 32.0°C during 2014. The annual median value for dissolved oxygen (6.2 mg/L) was indicative of well-oxygenated waters and within range of previous years. All monthly dissolved oxygen concentrations were above state minimum standard of 4.0 mg/L. All of the observations at this station continued to suggest excellent water quality.

Station ID: 19

Site: Falling Creek at Kay Road

Latitude: 37.4474

Longitude: 77.4468

Watershed: Falling Creek

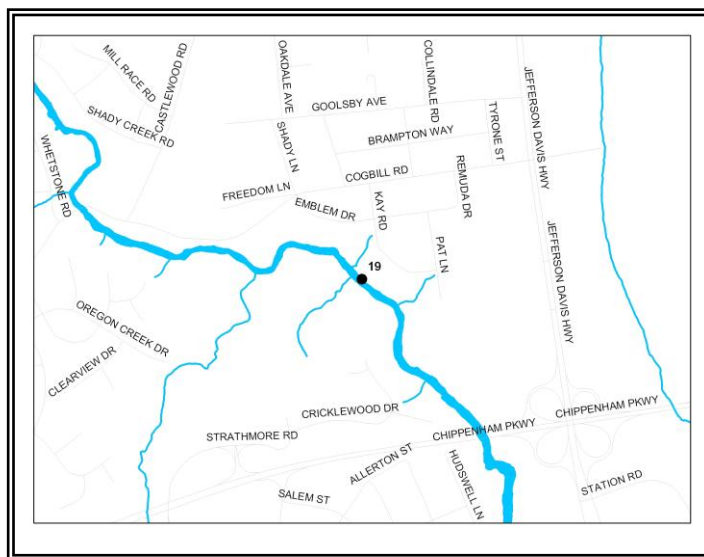
Land use: Residential, County Park

Number of Stations: 1

Number of Monitors: 2

Volunteer Hours: 6.0

Monitoring since: August 2010



This site is located on the mainstem of Falling Creek, one of the major waterways of Chesterfield County. The site lies adjacent to the county's Falling Creek Park in the northeastern portion of the county. Stream measurements and water samples were obtained once or twice per month during the months of March, July, August, September and December behind a private residence in the Ranch Acres subdivision. A total of six surveys were conducted during 2014.

Table 1-13. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
March	2	5.5	7.5	10.7	6.0	98.0	0.7
July	1	25.0	24.0	6.5	6.0	29.4	0.5
August	1	27.0	25.0	7.1	6.5	≥120.0	0.4
September	1	20.0	19.0	7.6	6.5	≥120.0	0.5
December	1	16.0	9.0	10.9	6.5	46.0	0.6
Minimum		5.5	7.5	6.5	6.0	29.4	0.4
Median		20.0	19.0	7.6	6.5	98.0	0.5
Maximum		27.0	25.0	10.9	6.5	≥120.0	0.7
2013 Annual Median		15.0	11.9	8.7	6.5	77.0	0.5
2012 Annual Median		22.0	21.0	9.9	6.5	64.2	0.6
2011 Annual Median		18.3	14.0	9.9	6.5	86.0	0.5
2010 Annual Median		21.0	18.5	7.9	6.8	≥130.0	0.5

Sampling at this Falling Creek site was conducted one to two times per month in four different months in 2014. Two surveys were conducted on overcast days. Four surveys occurred during partly cloudy days or overcast days and one was conducted on a clear/sunny day. One survey occurred on a day when showers were noted. Normal baseflow conditions were noted during three of the surveys and low flows were noted twice. High flows were noted in July. Water coloration was noted as light or dark brown on four surveys with a clear appearance noted in August and September. As in the previous years, no perceptible odors were observed during 2014.

Water depth at this site ranged from a low of 0.41 meters in August to 0.66 meters in March. The 2014 median depth for the sampling area was 0.53 meters, equal to the annual median of 2013. Individual transparency values ranged from a low of 29.4 centimeters in July to ≥ 120.0 centimeters August and September. The annual transparency median of 98.0 centimeters was an improvement over the 2013 median of 77.0 centimeters. All individual pH values (annual median 6.5 units) were within the 6.0 - 9.0 units state standard range. Monthly median surface temperatures ranged from 7.5 to 25.0°C and varied normally with season. No temperature readings exceeded the state standard of 32.0°C during 2014. All individual dissolved oxygen concentrations (annual median 7.6 mg/L) were well above state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. All of the observations made during 2014 at this station were suggestive of continued excellent water quality.

Station ID: 21

Site: Horner Run at Fernbrook Park

Latitude: 37.4419

Longitude: 77.5648

Watershed: Falling Creek

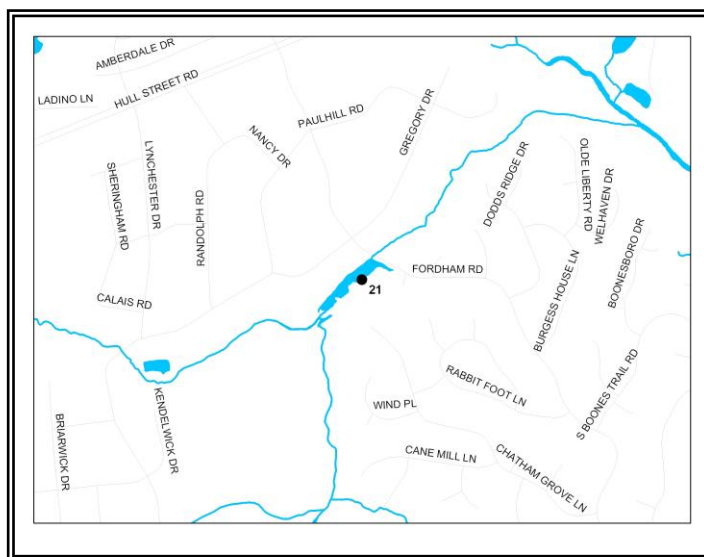
Land use: Residential

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 13.5

Monitoring since: November 2010



This site is located on Horner Run in the central area of Chesterfield County at the county's Fernbrook Park. Water samples were obtained once per month from January through December just north of the picnic shelter. A total of eleven surveys were conducted during 2014.

Table 1-14. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	9.0	5.0	10.3	6.5	77.0	*
February	1	5.0	4.5	10.0	6.5	27.0	*
March	1	20.5	9.5	10.5	6.5	96.0	*
April	1	16.5	17.0	10.0	6.5	70.0	*
May	1	26.0	20.0	6.8	6.5	97.0	*
June	1	27.0	26.0	4.7	6.5	50.0	*
July	1	31.0	30.5	9.0	7.0	67.0	*
August	1	25.5	25.5	9.7	7.0	87.0	*
September	1	30.5	29.5	7.5	6.5	76.0	*
October	1	22.0	19.0	7.9	6.5	76.0	*
December	1	13.5	5.5	9.2	6.5	92.0	*
Minimum		5.0	4.5	4.7	6.5	27.0	*
Median		22.0	19.0	9.2	6.5	76.0	*
Maximum		31.0	30.5	10.5	7.0	97.0	*
2013 Annual Median		15.5	15.5	8.8	6.5	76.0	*
2012 Annual Median		23.8	22.5	8.4	6.5	75.0	*
2011 Annual Median		22.3	17.8	8.7	6.5	83.5	*

Sampling of Horner Run was conducted eleven times during 2014. Nine surveys occurred on partly cloudy or overcast days and two occurred on clear/sunny days. Normal baseflow conditions were noted on ten of the surveys and high flows were noted in February. Water coloration was recorded as light brown on all surveys. As in past reports, there were no instances of perceptible odors noted in 2014. A variety of wildlife, including migratory waterfowl, fish and reptiles, were noted throughout the year.

As in previous years, water depth was not measured at this site during 2014. Monthly transparency values and medians ranged from a low of 27.0 centimeters in February to 97.0 centimeters in May. The 2013 transparency median of 76.0 centimeters was equal to the 2013 median. All individual pH values and the annual median pH value of 6.5 units were all within the 6.0 - 9.0 unit standard range set by the state and were similar to past observations. Median monthly surface temperatures ranged from a low of 4.5°C in February to a high of 30.5°C in July and varied normally with season. No individual values exceeded the state standard of 32.0°C during 2014. All individual dissolved oxygen concentrations (annual median 9.2 mg/L) were above the state minimum of 4.0 mg/L and were indicative of well-oxygenated waters. All of the observations made during 2014 at this station were suggestive of continued good water quality.

Station ID: 25

Site: Great Branch at Chalkley Road

Latitude: 37.3620

Longitude: 77.4776

Watershed: Proctors Creek

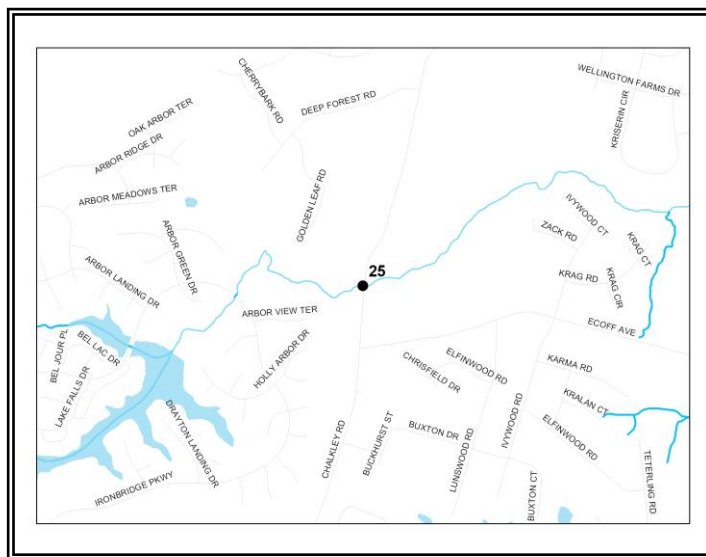
Land use: Residential
Ironbridge Lake

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 4.0

Monitoring since: June 2011



This site is located on the mainstem of Great Branch in the central area of Chesterfield County. Stream measurements and water samples were obtained once per month in March, June, September and December on the west side of the Chalkley Road culvert along the south bank of the creek. Four surveys were conducted during 2014.

Table 1-15. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
March	1	19.0	18.0	9.5	6.0	80.0	0.7
June	1	27.0	28.0	4.7	6.5	64.0	0.3
September	1	22.0	25.0	4.3	6.0	95.0	0.2
December	1	16.0	14.0	7.6	6.0	38.0	0.5
	Minimum	16.0	14.0	4.3	6.0	38.0	0.2
	Median	20.5	21.5	6.2	6.0	72.0	0.4
	Maximum	27.0	28.0	9.5	6.5	95.0	0.7
	2013 Annual Median	13.5	11.0	7.0	6.5	50.0	0.5
	2012 Annual Median	19.0	15.0	6.1	6.0	61.0	0.5
	2011 Annual Median	25.0	19.5	7.6	6.0	52.0	0.3

Sampling of this reach occurred four times in 2014. Two surveys were conducted on rainy days, one occurred on a partly cloudy day and one on a sunny day. Ripples or high flows were recorded on three surveys and calm conditions were noted once. All surveys recorded water appearance as light brown. Three surveys recorded an earthy odor in 2014.

Water depth at this site ranged from 0.2 to 0.7 meters during 2014 with a median depth of 0.4 meters. Transparency values ranged from 38.0 centimeters to 95 centimeters. The 2014 median transparency value of 72.0 centimeters was an increase over the 2013 median of 50.0 centimeters. All individual pH values were within the 6.0 - 9.0 units state standard range. Surface temperatures ranged from 14.0°C to 28.0°C and varied normally during the year. No temperature measurements in 2014 exceeded the state standard of 32.0°C.

The dissolved oxygen annual median was 6.2 mg/L. All individual dissolved oxygen values were above the state standard of 4.0 mg/L. All of the observations made during 2014 at this station were suggestive of continued good water quality.

Station ID: 26

Site: Marine Springs Branch at
Kings Farm Drive

Latitude: 37.5518

Longitude: 77.6633

Watershed: James River

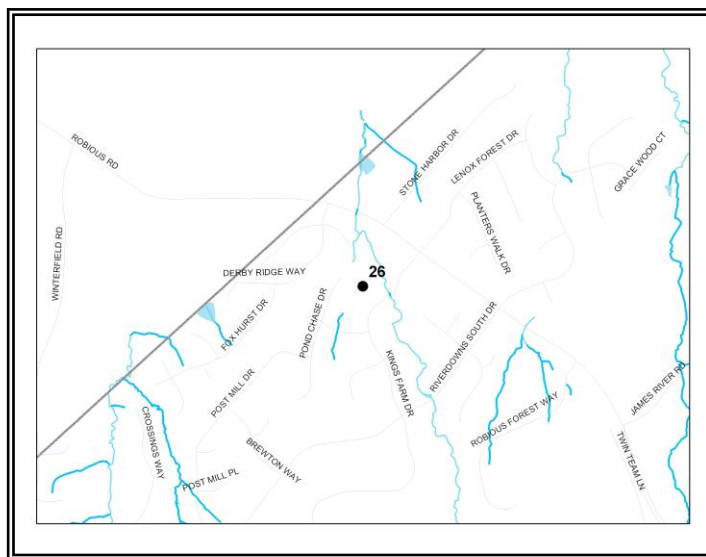
Land use: Residential

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 10.75

Monitoring since: May 2011



This site is located on Marine Springs Branch, a direct drainage to the James River in the northern area of Chesterfield County. Stream measurements and water samples were obtained once or twice per month west of the Kings Farm Drive culvert along the north bank of the creek. A total of thirteen surveys were conducted during 2014.

Table 1-16. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)	E. Coli (CFU/100ml)
January	1	8.5	7.0	10.9	6.0	≥120.0	0.3	0
February	1	1.6	5.0	11.0	6.0	≥120.0	0.3	0
March	1	13.0	5.0	11.1	6.5	≥120.0	0.2	0
April	1	16.0	12.0	9.9	6.0	≥120.0	0.1	0
May	1	21.0	14.0	9.0	6.0	≥120.0	0.3	0
June	2	25.5	20.5	7.9	6.5	≥120.0	0.1	150
July	1	22.5	21.0	8.2	6.5	≥120.0	0.1	220
August	1	*	*	*	*	*	*	*
September	1	*	*	*	*	*	*	*
October	1	*	*	*	*	*	*	*
November	1	18.0	16.0	9.2	6.5	≥120.0	0.0	0
December	1	7.0	8.0	9.3	6.0	≥120.0	0.1	100
Minimum		1.6	5.0	7.9	6.0	≥120.0	0.0	0
Median		16.0	12.0	9.3	6.0	≥120.0	0.1	0
Maximum		25.5	21.0	11.1	6.5	≥120.0	0.3	220
2013 Annual Median		21.5	14.5	9.4	6.0	≥120.0	0.1	<20
2012 Annual Median		21.0	14.0	8.9	6.5	≥130.0	0.1	55
2011 Annual Median		23.5	19.5	9.8	7.0	≥130.0	0.2	*

Surveys were conducted at Marine Springs Branch once per month from January through December of 2014. The creek had no flow in August, September and October. No data was collected for those three months. Clear/sunny conditions were noted on seven of the surveys and partly cloudy/overcast conditions were recorded on two surveys. Light rain was noted in February. Normal baseflow conditions were noted on four of the surveys and low flow was recorded on three surveys. High flow was recorded January through March. Clear water conditions were observed on all surveys in 2014. Trash was noted four times in 2014. There were no perceptible odors present during 2014.

Water depth at this site ranged from 0.03 to 0.25 meters during 2014 with an annual median depth of 0.14 meters. All monthly transparency values were ≥ 120.0 centimeters. The 2014 median transparency was ≥ 120.0 centimeters and is consistent with previous years. All individual pH values (annual median 6.0 units) were within the 6.0 - 9.0 units state standard range. Surface temperatures ranged from 5.0 to 21.0°C and varied normally with season. No temperature measurements in 2014 exceeded the state standard of 32.0°C. All monthly dissolved oxygen concentrations (annual median 9.3 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Monthly *E. coli* measurements were made at this site during 2014. Samples were incubated for approximately 50 hours at approximately 25°C with resulting densities ranging from <20 to 220CFU/100ml. There were no instances when *E. coli* values exceeded the 235 CFU/100ml VA DEQ state bacterial standard for recreational contact. All of the observations made during 2014 at this station were suggestive of continued good water quality.

Station ID: 28

Site: Oldtown Creek at
Branders Bridge Road

Latitude: 37.2618

Longitude: 77.4239

Watershed: Appomattox River

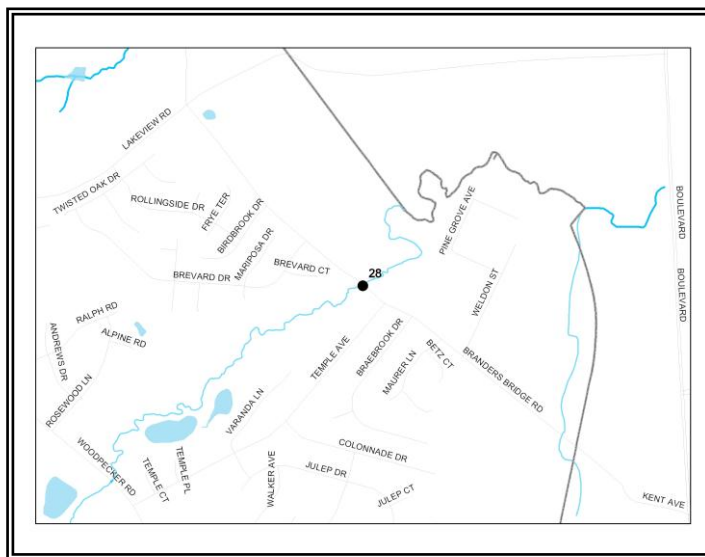
Land use: Residential, Forest

Number of Stations: 1

Number of Monitors: 2

Volunteer Hours: 5.5

Monitoring since: December
2011



This site is located on the mainstem of Oldtown Creek, which drains to the Appomattox River in the southeastern area of Chesterfield County. Stream measurements and water samples were obtained once per month from January through December immediately upstream of the Branders Bridge Road crossing. A total of eleven surveys were conducted during 2014.

Table 1-17. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	8.0	1.0	12.4	6.5	75.6	*
February	1	3.5	4.0	13.1	6.0	64.5	*
March	1	21.0	13.0	13.1	6.5	46.0	*
April	1	21.0	16.0	9.7	6.0	45.2	*
May	1	18.0	19.0	6.1	6.0	47.0	*
June	1	32.0	24.0	9.1	6.0	44.0	*
July	1	30.0	22.0	7.8	6.0	54.0	*
September	1	22.0	17.0	12.8	6.0	44.3	*
October	1	15.0	12.0	6.1	6.0	18.0	*
November	1	9.0	5.0	10.3	6.0	58.6	*
December	1	10.0	6.0	9.7	6.0	75.0	*
Minimum		3.5	1.0	6.1	6.0	18.0	*
Median		18.0	13.0	9.7	6.0	47.0	*
Maximum		32.0	24.0	13.1	6.5	75.6	*
2013 Annual Median		23.0	14.5	9.9	6.0	46.0	*
2012 Annual Median		21.0	14.8	10.0	6.0	52.0	*

Sampling at Oldtown Creek occurred from January through December of 2014. No samples were taken in August. Seven surveys were conducted during clear/sunny days and four were conducted on overcast or partly cloudy days. Normal baseflow conditions were noted during six surveys and low flows were noted four times. High flows were noted in December. Water coloration was recorded as either light or dark brown on all surveys. Leaves and debris were observed twice. Pollen was noted in May. No odors were noted in 2014.

Water depth was not measured at this site during 2014. Transparency values ranged from a low of 18.0 centimeters in October to a high of 75.6 centimeters in January. The annual median transparency value was 47.0 centimeters and was indicative of reduced water clarity. All individual pH values (annual median of 6.0 units) were within the 6.0 - 9.0 units state standard range. Surface temperatures varied normally according to season and ranged from 1.0 to 24.0°C. No temperature measurements exceeded the state standard of 32.0°C. Dissolved oxygen concentrations ranged from a low of 6.1 mg/L in May to 13.1 mg/L in February and March with a resulting annual median value observed at 9.7 mg/L and indicated highly oxygenated waters. No observations of dissolved oxygen fell below the state minimum of 4.0 mg/L. The reduced clarity observed combined with the excellent pH, temperature and dissolved oxygen measurements were suggestive of very good water quality at this site.

Station ID: 29

Site: Otterdale Branch at Lake Summer Place

Latitude: 37.4416

Longitude: 77.7119

Watershed: Swift Creek Reservoir

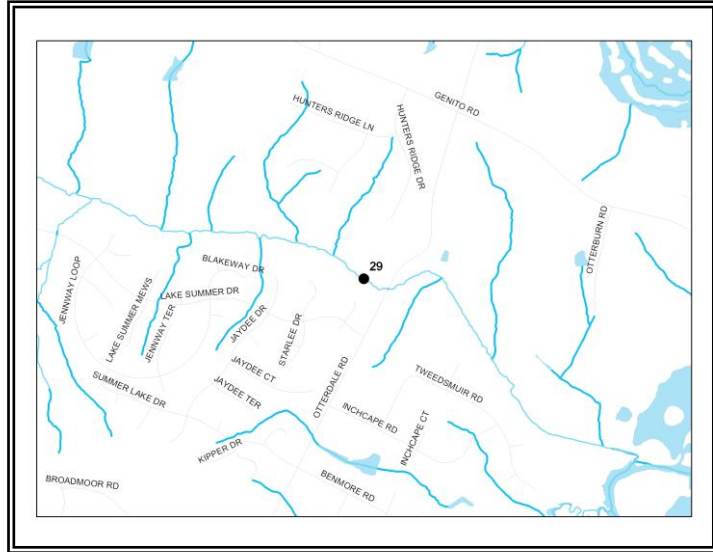
Land use: Residential, Forest

Number of Stations: 1

Number of Monitors: 2

Volunteer Hours: 10.0

Monitoring since: November 2011



This site is located on Otterdale Branch, a major drainage to the Swift Creek Reservoir located in the northwestern portion of Chesterfield County. Stream measurements and water samples were obtained once per month from January through December just off the pedestrian trail located behind 4400 Lake Summer Place. A total of ten surveys were conducted during 2014.

Table 1-18. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	11.0	1.0	11.6	6.5	100.3	*
February	1	21.0	9.0	9.4	6.5	89.8	*
March	1	26.0	13.5	8.4	6.5	52.0	*
April	1	27.5	18.0	7.3	6.0	44.0	*
May	1	19.0	17.5	7.6	6.5	83.7	*
June	1	27.0	22.0	5.9	6.0	≥120.0	*
July	1	23.5	19.0	6.1	6.5	≥120.0	*
October	1	18.0	14.0	7.5	6.5	≥120.0	*
November	1	6.0	6.0	9.7	6.5	≥120.0	*
December	1	12.0	7.0	8.8	6.5	≥120.0	*
Minimum		6.0	1.0	5.9	6.0	44.0	*
Median		20.0	13.8	8.0	6.5	110.2	*
Maximum		27.5	22.0	11.6	6.5	≥120.0	*
2013 Annual Median		19.0	15.8	6.7	6.5	73.1	*
2012 Annual Median		18.5	14.5	5.8	6.5	105.0	*

Surveys were conducted monthly Otterdale Branch from January through December of 2014. No surveys were conducted in August or September. Seven surveys occurred on clear/sunny days and three surveys noted partly cloudy or overcast conditions. Normal baseflow conditions were noted seven times and high flows were noted in February, March and April. Clear water was noted on five surveys and a light brown coloration was noted five times. A “rotten eggs” odor was noted in January. No other perceptible odors were recorded during the year.

Water depth was not measured at this site during 2014. Water clarity ranged from a low of 44.0 centimeters in April to ≥ 120.0 centimeters from June through December. The annual median value was 110.2 centimeters. All pH values (annual median of 6.5 units) were within the 6.0 - 9.0 units state standard range. Surface temperatures ranged from 1.0 to 22.0°C and varied normally with season. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All monthly dissolved oxygen concentrations (annual median 8.0 mg/L) were above state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Overall measurements at this site were characteristic of good water quality.

Station ID: 30

Site: West Branch at Prescotts Level

Latitude: 37.4086

Longitude: 77.7132

Watershed: Swift Creek Reservoir

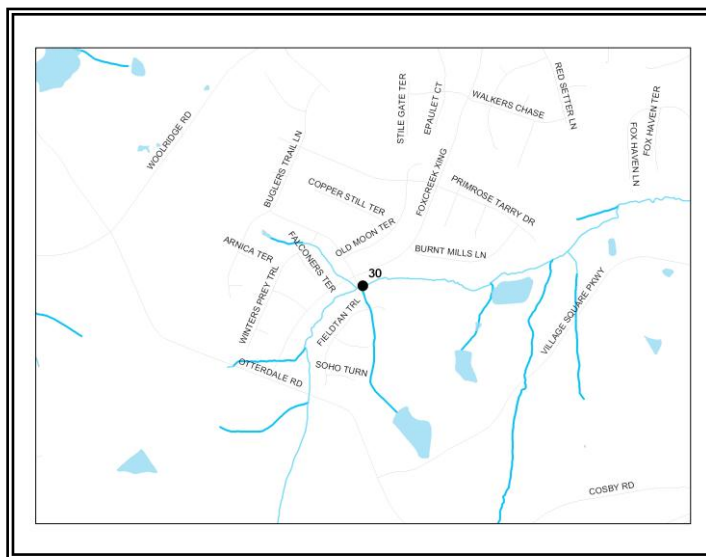
Land use: Residential, Forest

Number of Stations: 1

Number of Monitors: 2

Volunteer Hours: 10.0

Monitoring since: January 2012



This site is located on West Branch, a major drainage to the Swift Creek Reservoir located in the northwestern portion of Chesterfield County. Water samples were obtained once per month from January through December along the south bank of the stream immediately west of the Prescotts Level culvert. A total of ten surveys were conducted during 2014.

Table 1-19. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	7.0	2.0	11.2	6.5	61.0	*
February	1	20.0	9.0	9.5	6.5	108.0	*
March	1	19.5	13.5	8.5	6.5	89.6	*
April	1	23.5	18.0	7.4	6.0	55.0	*
May	1	23.0	18.0	6.9	6.5	66.5	*
June	1	26.5	22.0	9.0	6.5	84.2	*
July	1	28.0	23.0	5.5	6.5	52.0	*
October	1	18.0	14.0	7.8	6.5	≥120.0	*
November	1	6.0	6.0	8.7	6.5	≥120.0	*
December	1	12.0	7.0	8.7	6.5	≥120.0	*
Minimum		6.0	2.0	5.5	6.0	52.0	*
Median		19.8	13.8	8.6	6.5	86.9	*
Maximum		28.0	23.0	11.2	6.5	≥120.0	*
2013 Annual Median		18.0	16.0	7.6	6.5	95.8	*
2012 Annual Median		25.1	17.9	6.6	6.5	≥130.0	*

Surveys were conducted at West Branch January through December of 2014. No surveys were conducted in August or September. Seven survey events occurred on clear/sunny days and three surveys occurred on partly cloudy or overcast days. Normal baseflow conditions were noted on six surveys and low flow was observed twice, in August and November. High flows were recorded in March and April. Clear water was noted on five surveys and light brown conditions were noted the rest of the year. In addition to being light brown, the water was also noted as “cloudy in January. No perceptible odors were recorded during 2014.

Water depth was not measured at this site during 2014. Water clarity ranged from a low of 52° centimeters in July to ≥ 120.0 centimeters in October, November and December. The annual median transparency value was 86.9 centimeters and represented a decline from 2013 median of 95.8 centimeters. This was the second consecutive decline in two years at this site. All pH values (annual median 6.5 units) were within the 6.0 - 9.0 units state standard range and varied little throughout the year. Surface temperatures ranged from 2.0 to 23.0°C and varied normally with season. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All monthly dissolved oxygen concentrations (annual median of 8.6 mg/L) were above the state minimum standard of 4.0 mg/L and represented an improvement over the 2013 median of 7.6 mg/L. Overall measurements at this site were characteristic of very good water quality.

Station ID: 31

Site: Tributary to Pocoshock Creek at A.M. Davis Elementary School

Latitude: 37.4920

Longitude: 77.5431

Watershed: Falling Creek

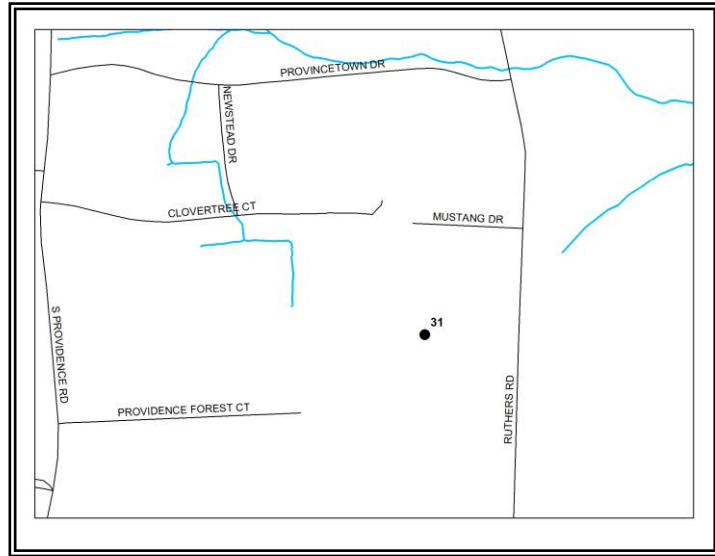
Land use: Residential, School

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 10.0

Monitoring since: August 2014



This site is located on a tributary to Pocoshock Creek at A.M. Davis Elementary School in the northeastern portion of Chesterfield County. Water samples were obtained once per month on the west bank of the creek on the school's nature trail in August, September and December. Three surveys were conducted in 2014.

Table 1-20. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
August	1	27.0	24.0	6.1	6.5	43.0	0.2
September	1	24.0	23.0	4.0	6.0	20.0	0.2
December	1	9.0	9.5	7.3	6.5	≥120.0	0.2
	Minimum	9.0	9.5	4.0	6.0	20.0	0.2
	Median	24.0	23.0	6.1	6.5	43.0	0.2
	Maximum	27.0	24.0	7.3	6.5	≥120.0	0.2

Three surveys were conducted in August, September and December in 2014. Two survey events occurred on clear/sunny days and one survey occurred on an overcast day. Low flow conditions were noted on two surveys and normal baseflow conditions were noted once. Clear water was noted on all surveys and the August and September surveys noted a milky appearance as well. No perceptible odors were recorded during 2014.

Water depth was measured as 0.2 meters on each survey. Water clarity ranged from a low of 43 centimeters to ≥120.0 centimeters. The annual median transparency of 43.0 centimeters was indicative of reduced clarity at this site. All pH values (annual median 6.5 units) were within the 6.0 - 9.0 units state standard range. Surface temperatures ranged from 9.0°C in December to 24.0°C in August and varied normally with season. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All monthly dissolved oxygen concentrations (annual median of 6.1 mg/L) were at or above the state minimum standard of 4.0 mg/L. Overall measurements at this site were characteristic of fair water quality.

Station ID: 32

Site: Tributary to Powwhite Creek at Bloomfield Road

Latitude: 37.5227

Longitude: 77.5410

Watershed: James River

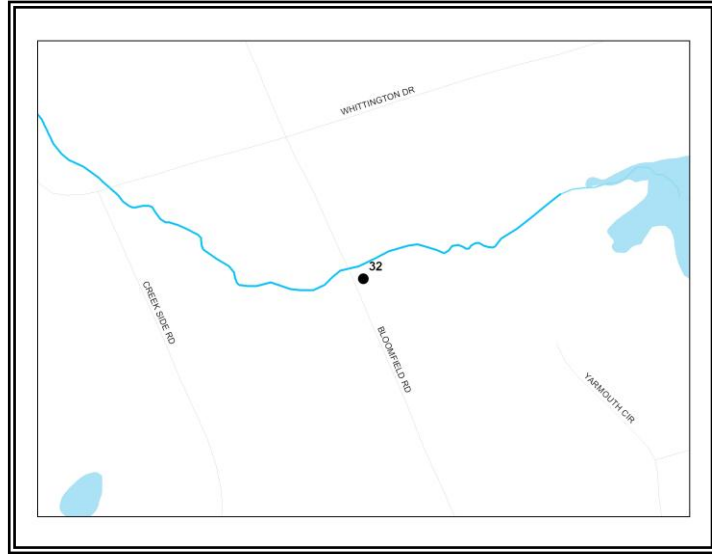
Land use: Residential, Forest

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 4.5

Monitoring since: June 2012



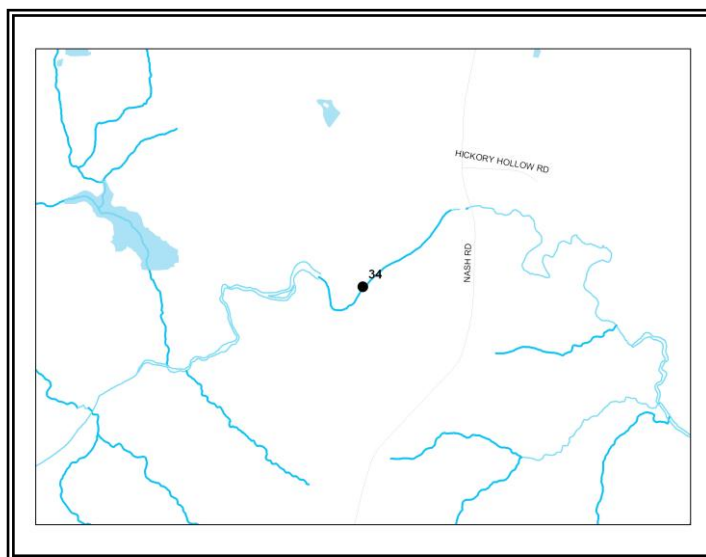
This site is located on a Tributary to Powwhite Creek, a direct drainage to the James River located in the northeastern portion of Chesterfield County. Monitoring resumed at this site in 2014 after an absence of testing in 2013. Stream measurements and water samples were obtained once per month in November and December on the east side of Bloomfield Road at the downstream end of the culvert. Two surveys were conducted during 2014.

Table 1-21. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
November	1	18.5	10.5	8.7	7.0	≥120.0	*
December	1	18.0	11.0	8.9	7.0	≥120.0	*
	Minimum	18.0	10.5	8.7	7.0	≥120.0	*
	Median	18.3	10.8	8.8	7.0	≥120.0	*
	Maximum	18.5	11.0	8.9	7.0	≥120.0	*

Surveys were conducted at this tributary to Powwhite Creek once per month in November and December of 2014. Each survey event occurred on clear/sunny days. Normal baseflow conditions were noted on each survey. Clear water was noted on each survey. No perceptible odors were recorded during 2014.

Water depth was not measured at this site during 2014. Water clarity was measured at ≥120.0 centimeters on each survey. All measured and median pH values were within the 6.0 - 9.0 unit standard range set by VA DEQ. Measured surface temperatures ranged from 10.5 to 11.0°C and were normal for the season. No temperature measurement in 2014 exceeded the VA DEQ standard of 32.0°C. All dissolved oxygen measurements were above VA DEQ's 4.0 mg/L limit. Overall measurements at this site were characteristic of good water quality.

Station ID: 34**Site:** Second Branch at Nash Road**Latitude:** 37.3221**Longitude:** 77.5573**Watershed:** Swift Creek**Land use:** Residential, Forest**Number of Stations:** 1**Number of Monitors:** 1**Volunteer Hours:** 12.0**Monitoring since:** March 2012

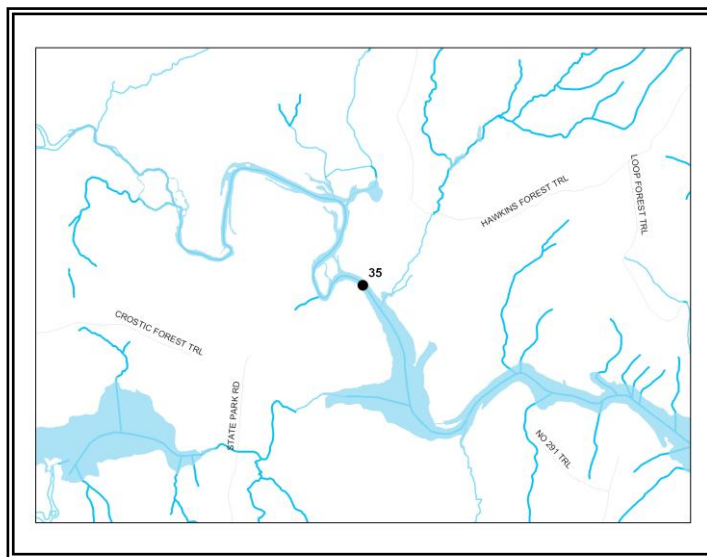
This site is located on Second Branch in the south central area of Chesterfield County near its crossing with Nash Road. Stream measurements and water samples were obtained once or twice per month from January through December. The site is located at the end of the path immediately behind 12900 Nash Road along the south bank of the stream. A total of twelve surveys were conducted during 2014.

Table 1-22. Monthly values and annual medians for each water quality parameter measured during 2014.

<u>Date</u>	<u>n</u>	<u>Air Temperature</u> (°C)	<u>Surface</u> (°C)	<u>Dissolved</u> (mg/L)	<u>pH</u>	<u>Transparency</u> (cm)	<u>Water Depth</u> (m)
January	1	8.0	0.0	14.1	6.5	61.0	1.1
February	1	1.0	0.0	11.2	6.0	64.8	1.1
March	1	19.0	11.0	10.7	6.0	74.4	1.2
April	1	30.0	18.0	9.7	6.0	20.2	1.4
May	1	28.0	22.0	9.9	6.5	67.8	0.9
June	1	29.0	26.0	9.3	6.5	63.2	0.9
July	1	26.0	25.0	10.1	6.5	27.8	0.9
August	1	23.0	23.0	8.6	6.5	67.4	1.1
September	1	17.0	16.0	9.4	6.5	72.0	1.1
October	1	14.0	12.0	5.0	6.0	70.8	1.3
November	1	13.0	5.0	10.2	6.0	50.8	1.1
December	1	12.0	7.0	9.8	6.5	68.6	1.2
Minimum		1.0	0.0	5.0	6.0	20.2	0.9
Median		18.0	14.0	9.9	6.5	66.1	1.1
Maximum		30.0	26.0	14.1	6.5	74.4	1.4
2013 Annual Median		19.8	16.0	10.0	6.5	70.2	1.1
2012 Annual Median		23.0	17.0	9.7	5.0	55.0	1.2

Surveys were conducted at this Second Branch reach once per month from January through December of 2014. Ten survey events occurred on clear/sunny days and two occurred on partly cloudy days. Normal baseflow conditions were noted on seven surveys and low flows were noted four times. High low conditions were noted in April after a day of rain. Water coloration was recorded as either light or dark brown on all surveys. A milky appearance was also noted in July. Leaves and debris were noted May through October. No perceptible odors were recorded during 2014.

Water depth at this site ranged from 0.90 to 1.40 meters during 2014 with an annual median depth of 1.07 meters. Water clarity ranged from a low of 20.2 centimeters in April to a high of 74.4 centimeters in March. The annual median transparency value was calculated at 66.1 centimeters and was a decrease from the 2013 median of 70.2 centimeters but within the range of previously recorded measurements. Measurements of pH ranged from 6.0 to 6.5 units with an annual median of 6.5 units. This was equal to the 2013 annual median and within the 6.0 - 9.0 unit standard range set by VA DEQ. Second Branch has been listed on the state's impaired waters list since 2010 for "naturally occurring" low pH but the last two years may represent an improvement. Surface temperatures ranged from 0.0 to 26.0°C and were normal with the seasons. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All individual dissolved oxygen concentrations (annual median 9.9 mg/L) were above the state minimum of 4.0 mg/L and were indicative of highly oxygenated waters. Overall measurements at this site were characteristic of good water quality.

Station ID: 35**Site:** Swift Creek at Pocahontas State Park**Latitude:** 37.3898**Longitude:** 77.5759**Watershed:** Swift Creek**Land use:** Residential, Commercial, Forest, Park**Number of Stations:** 1**Number of Monitors:** 1**Volunteer Hours:** 2.75**Monitoring since:** March 2012

This site is located on the mainstem of Swift Creek, one of the major waterways of Chesterfield County. The site lies within the confines of Pocahontas State Park in the central portion of Chesterfield County. Stream measurements and water samples were obtained from Swift Creek once per month from October through December at the pedestrian bridge where the creek joins with Swift Creek Lake. Three surveys were conducted during 2014.

Table 1-23. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
October	1	19.5	21.0	4.7	6.5	47.0	*
November	1	29.0	18.0	6.1	6.5	85.0	*
December	1	12.0	9.0	8.2	6.5	100.0	*
	Minimum	12.0	9.0	4.7	6.5	47.0	*
	Median	19.5	18.0	6.1	6.5	85.0	*
	Maximum	29.0	21.0	8.2	6.5	100.0	*
	2013 Annual Median	20.0	16.0	7.4	6.5	88.0	2.8
	2012 Annual Median	25.0	21.0	7.5	6.5	90.5	2.7

Surveys were conducted at this Swift Creek reach over a three month period during 2014. Each survey occurred on a clear/sunny day. The water surface was noted as having ripples each survey. Water coloration was noted as light brown on each survey. No perceptible odors were noted in 2014.

Water depth was not recorded at this site in 2014. Water clarity ranged from 47.0 centimeters in October to 100.0 centimeters in December. The monitoring period median transparency value was calculated at 85.0 centimeters and was indicative of good water clarity. All pH values (monitoring period of median 6.5 units) were within the 6.0 - 9.0 state standard range. Surface temperatures ranged from 9.0 to 21.0°C. No recorded surface temperatures exceeded the state standard of 32.0°C. All monthly dissolved

oxygen concentrations (monitoring period median of 6.1 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Overall observations made during 2014 at this station were suggestive of continuing good water quality.

Station ID: 35.1**Site:** Swift Creek Lake at
Pocahontas State Park**Latitude:** 37.3888**Longitude:** 77.5752**Watershed:** Swift Creek**Land use:** Residential,
Commercial,

Forest, Park

Number of Stations: 1**Number of Monitors:** 1**Volunteer Hours:** 2.75**Monitoring since:** July 2014

This site is located on an impoundment of Swift Creek in Pocahontas State Park approximately 85 meters downstream of Station 35. Samples were obtained once per month from June through December of 2014 at the dock next to the park boat rental station. Seven surveys were conducted in 2014. 2014 was the first year that surveys were conducted at this station.

Table 1-24. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
June	1	29.0	28.0	6.6	7.0	57.8	*
July	1	31.0	28.0	7.3	7.5	60.2	*
August	1	26.0	27.0	6.9	7.0	59.8	*
September	1	25.0	26.0	7.1	7.0	55.2	*
October	1	28.0	22.0	5.3	6.5	54.0	*
November	1	29.0	18.0	6.0	6.5	85.1	*
December	1	12.0	9.0	8.3	6.5	100.0	*
	Minimum	12.0	9.0	5.3	6.5	54.0	*
	Median	28.0	26.0	6.9	7.0	59.8	*
	Maximum	31.0	28.0	8.3	7.5	100.0	*

Surveys were conducted at this Swift Creek reach over a seven month period during 2014. Partly cloudy or overcast conditions were noted on three surveys. Clear/ sunny conditions were noted tow times and showers/light rain were noted in November and December. The water surface was noted as normal July through September and as having ripples October through December. Low conditions were noted in June. Water coloration was noted as light brown on each survey. No perceptible odors were noted in 2014.

Water depth was not recorded at this site in 2014. Water clarity ranged from 54.0 centimeters in October to 100.0 centimeters in December. The monitoring period median

transparency value was calculated at 59.8 centimeters and was indicative of marginal water clarity. All pH values (monitoring period median of 7.0 units) were within the 6.0 - 9.0 state standard range. Surface temperatures ranged from 9.0°C in December to 28.0°C in June. No recorded surface temperatures exceeded the state standard of 32.0°C. All monthly dissolved oxygen concentrations (monitoring period median of 6.9 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Overall observations made during 2014 at this station were suggestive of good water quality.

Station ID: 36

Site: Marine Springs Branch at
Knights Run Drive

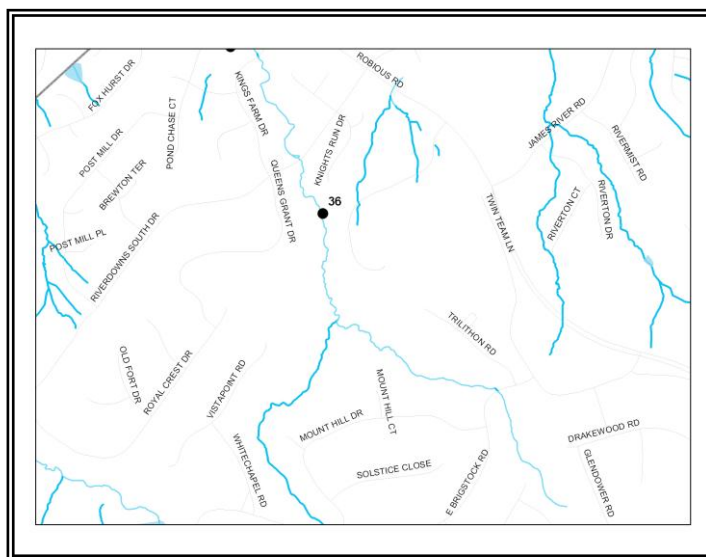
Latitude: 37.5465

Longitude: 77.6597

Watershed: James River

Land use: Residential

Number of Stations: 1

Number of Monitors: 1**Volunteer Hours: 24.0****Monitoring since:** August 2012

This site is located on Marine Springs Branch, a direct drainage to the James River in the northern area of Chesterfield County. Stream measurements and water samples were obtained once per month from January through December. The site is approximately 75 meters southwest of 13800 Knights Run Drive and approximately 580 meters upstream of site 26, which is also on Marine Springs Branch. Twelve surveys were conducted during 2014.

Table 1-25. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	15.0	8.0	6.6	7.0	≥120.0	0.1
February	1	10.0	10.0	6.9	7.0	≥120.0	0.1
March	1	17.0	10.0	8.3	7.0	≥120.0	0.1
April	1	16.0	14.0	7.2	7.0	≥120.0	0.2
May	1	18.0	15.0	7.5	7.0	≥120.0	0.2
June	1	23.0	18.0	7.4	7.0	≥120.0	0.2
July	1	25.0	23.0	7.3	7.0	≥120.0	0.1
August	1	29.0	20.0	7.1	7.0	≥120.0	0.0
September	1	26.0	17.0	5.0	7.0	≥120.0	0.1
October	1	22.0	15.0	7.7	7.0	≥120.0	0.1
November	1	21.0	14.0	7.3	7.0	≥120.0	0.1
December	1	16.0	13.0	8.5	7.0	≥120.0	0.1
	Minimum	10.0	8.0	5.0	7.0	≥120.0	0.0
	Median	19.5	14.5	7.3	7.0	≥120.0	0.1
	Maximum	29.0	23.0	8.5	7.0	≥120.0	0.2
	2013 Annual Median	21.0	15.0	8.0	7.0	≥120.0	0.2
	2012 Annual Median	16.0	13.5	7.8	7.0	≥130.0	0.2

Surveys were conducted at this site for twelve months beginning from January to December 2014. Eight surveys occurred on clear/sunny days. Four surveys were conducted on partly cloudy or overcast days. Normal flows were noted during the first six months of the year. Flows were noted as low or negligible the last six months of the year. Water coloration was noted as clear on all surveys except August when it was noted as dark brown. Leaves and debris were noted on seven surveys. Trash was noted in August and October. Algae were noted in July. The creek was noted as nearly dry in

August when only a few puddles were present. An earthy odor was noted in January through March and again in July. Crayfish were noted on several surveys. Minnows were noted in June and tadpoles were noted in the few pools in July.

Water depth ranged from 0.00 to 0.18 meters. The monitoring period median depth was 0.12 meters. All individual transparency measurements were ≥ 120.0 centimeters and were indicative of a high degree of water clarity. All pH values (annual median 7.0 units) were within the 6.0 - 9.0 units state standard range. Surface temperatures ranged from 8.0 to 23.0°C and were normal for the time of the year. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All individual dissolved oxygen concentrations (annual median 7.3 mg/L) were well above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. All of the observations made during 2014 at this station were suggestive of excellent water quality.

Station ID: 37

Site: Tributary to Michaux Creek at Lastingham Drive

Latitude: 37.5223

Longitude: 77.6843

Watershed: James River

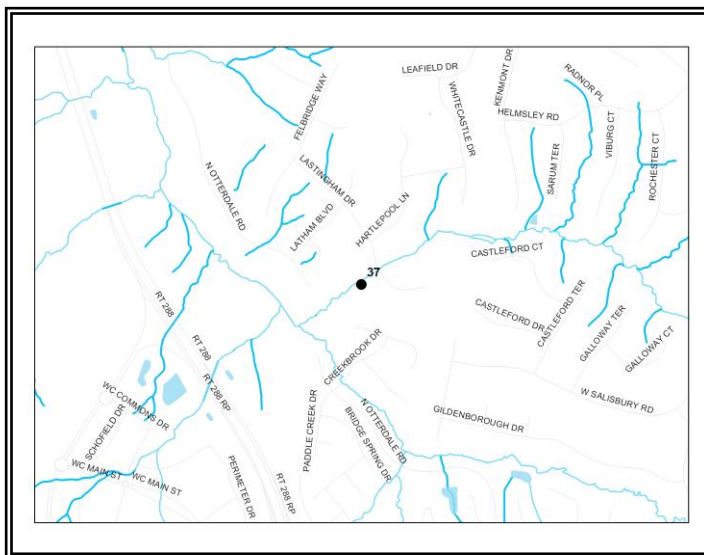
Land use: Residential, Forest

Number of Stations: 1

Number of Monitors: 1

Volunteer Hours: 20.0

Monitoring since: August 2012



This site is located on a tributary to Michaux Creek, a direct drainage to the James River in the northern area of Chesterfield County. Stream measurements and water samples were obtained one to three times per month from January to December at Lastingham Drive. A total of twenty surveys were conducted during 2014.

Table 1-26. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (oC)	Surface (oC)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	8.5	6.5	10.6	6.5	≥120.0	0.5
February	3	9.5	6.5	11.6	6.5	≥120.0	1.0
March	3	15.0	10.5	10.5	6.5	≥120.0	0.5
April	1	18.0	15.5	9.6	6.5	≥120.0	1.0
May	2	25.3	16.5	8.7	6.5	≥120.0	0.8
June	1	26.0	19.5	7.7	6.5	≥120.0	0.5
July	1	26.0	22.0	6.6	6.5	≥120.0	0.3
August	2	24.0	20.5	7.1	6.5	≥120.0	0.1
September	2	23.0	17.0	7.6	6.5	≥120.0	0.1
October	1	19.5	13.5	8.6	6.5	≥120.0	0.3
November	1	11.0	6.5	10.8	6.5	≥120.0	0.3
December	2	8.8	6.9	10.5	6.5	≥120.0	0.6
Minimum		8.5	6.5	6.6	6.5	≥120.0	0.1
Median		18.8	14.5	9.2	6.5	≥120.0	0.5
Maximum		26.0	22.0	11.6	6.5	≥120.0	1.0
2013 Annual Median		19.8	16.0	9.5	6.5	120.0	0.9
2012 Annual Median		19.0	15.5	8.6	6.5	≥130.0	1.0

Surveys were conducted at the tributary to Michaux Creek reach for twelve months beginning in January. Twelve survey events occurred on clear/sunny days and seven surveys occurred on partly cloudy days. Rain was noted on one survey. Normal baseflow conditions were noted on 12 surveys. Low conditions were noted on six surveys. Negligible flows were noted on one August survey and again in the first September survey. Chemical and physical parameters were not tested on these surveys. The stream's water was clear on all monitoring visits except March when it was also noted as milky. Water coloration was not recorded when the flows were noted as negligible. There were no perceptible odors recorded during 2014.

Water depth ranged from a low of 0.13 meter to of 1.00 meter. The 2014 median depth was 0.50 meters. The annual median transparency was ≥ 120.0 centimeters and was indicative of a high degree of water clarity. All pH values (annual median 6.5 units) were within the 6.0 - 9.0 units state standard range. Surface temperatures ranged from 6.5°C to 22.0°C and were normal for the time of the year. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All individual oxygen concentrations (annual median 9.2 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. All of the observations made during 2014 at this station were suggestive of continuing excellent water quality.

Station ID: 46

Site: Appomattox River in Ettrick, VA

Latitude: 37.2328

Longitude: -77.4158

Watershed: Appomattox River

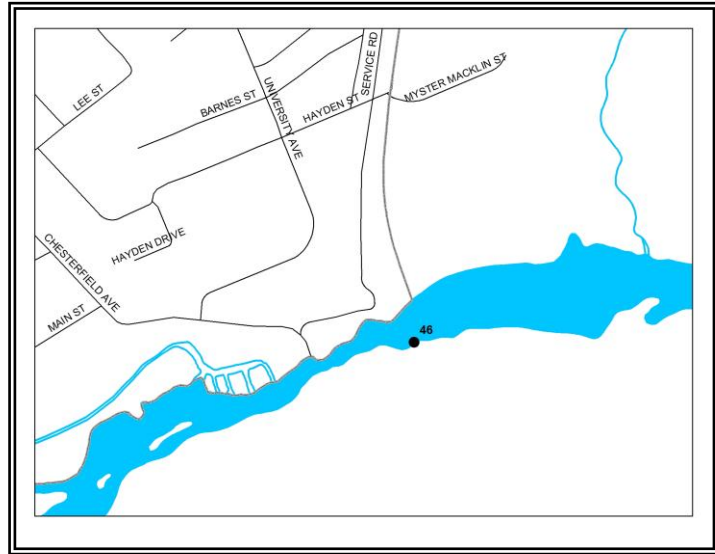
Land use: Commercial, Urban

Number of Stations: 1

Volunteer Hours: 22.5

Number of Monitors: 1

Monitoring since: October 2013



This site is located on the Appomattox River on the northern border of Petersburg. Water samples were obtained once or twice per month for twelve months in 2014. Seventeen surveys were conducted during 2014.

Table 1-27. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	14.0	7.0	10.2	6.5	20.1	*
February	1	1.0	7.0	10.4	6.5	27.8	*
March	1	20.0	11.0	9.8	7.0	54.1	*
April	2	26.5	16.1	8.2	7.0	79.0	*
May	2	26.6	19.0	7.0	6.5	43.4	*
June	2	25.8	25.5	7.0	7.5	110.7	*
July	2	27.1	26.6	6.5	7.0	≥120.0	*
August	1	28.0	25.2	6.6	7.0	≥120.0	*
September	2	23.7	25.1	7.4	7.3	≥120.0	*
October	1	22.0	16.2	8.2	7.0	≥120.0	*
November	1	15.0	8.0	10.9	8.0	≥120.0	*
December	1	16.2	9.0	12.3	7.0	≥120.0	*
Minimum		1.0	7.0	6.5	6.5	20.1	*
Median		22.9	16.2	8.2	7.0	115.4	*
Maximum		28.0	26.6	12.3	8.0	≥120.0	*
2013 Annual Median		7.0	10.0	11.1	8.0	≥120.0	*

Surveys were conducted at this site for twelve months beginning from January to December of 2014. Eleven surveys occurred on clear/sunny days. Six surveys occurred on partly cloudy or overcast days. Showers were noted on the July 27, 2014 survey that was also noted as overcast. Normal baseflow conditions were recorded on seven surveys. High flows were recorded in April and May. Water flow and depth diminished for the last eight surveys of the year due to the removal of a dam downstream of the monitoring location. Water coloration was described as varying degrees of brown and noted as turbid or green from January to August. Clearer conditions were noted September through December. Trash was noted most of the year. Algae was noted in March. An earthy odor was noted five times. A fishy odor was noted in November.

Water depth was not measured at this site during 2014. Transparency ranged from a low of 20.1 centimeters in January to a high of ≥ 120.0 centimeters from July to December. The 2014 annual median transparency value of 115.4 centimeters was indicative of clear conditions. All individual pH measurements (annual median of 7.0 units) were within the 6.0 - 9.0 units state standard. Surface temperatures ranged from 7.0 to 26.6°C and were normal for the time of the year. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All individual dissolved oxygen concentrations (annual median of 8.2 mg/L) were above the state minimum of 4.0 mg/L and were indicative of well-oxygenated waters. Overall observations made during 2014 at this station were suggestive of good water quality.

Station ID: 47

Site: Tributary to Falling Creek
at Krossridge Road

Latitude: 37.4570

Longitude: -77.6000

Watershed: Falling Creek

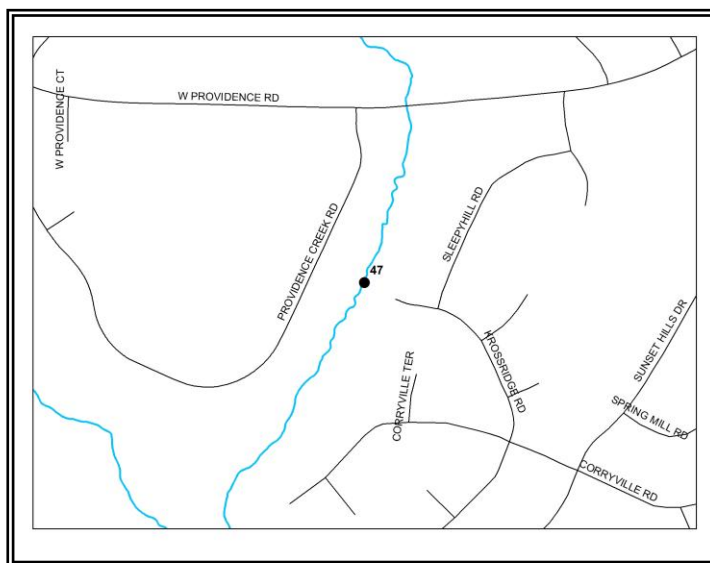
Land use: Residential

Number of Stations: 1

Volunteer Hours: 8.25

Number of Monitors: 1

Monitoring since: November
2013



This site is located on an unnamed tributary to Falling Creek in the north central area of Chesterfield. Stream measurements and water samples were obtained once or twice per month from January through December. No surveys were conducted in February, June and October. Eleven surveys were conducted during 2014.

Table 1-28. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
January	1	5.0	3.0	9.9	6.5	≥120.0	0.3
March	1	16.5	11.0	9.6	6.5	112.0	0.2
April	1	21.0	15.5	9.3	6.5	≥120.0	0.3
May	1	28.0	20.0	7.0	6.5	≥120.0	0.2
July	2	28.5	25.0	6.5	6.5	117.5	0.2
August	1	27.0	22.0	6.9	6.5	≥120.0	0.1
September	1	26.0	21.0	6.7	6.5	≥120.0	0.2
November	2	15.5	10.5	7.8	6.5	≥120.0	0.2
December	1	5.0	8.0	9.7	6.5	52.0	0.2
Minimum		5.0	3.0	6.5	6.5	52.0	0.1
Median		21.0	15.5	7.8	6.5	≥120.0	0.2
Maximum		28.5	25.0	9.9	6.5	≥120.0	0.3
2013 Annual Median		11.0	8.5	8.5	6.5	94.0	0.3

Surveys were conducted at this site eleven times in 2014. Six surveys occurred on clear/sunny days. Five surveys occurred on partly cloudy or overcast days. Low flow conditions were noted on six surveys from May to November. Normal baseflow conditions were recorded four times. High flows were noted in December. Water coloration was described as light to dark brown during on ten surveys. Clear conditions were noted in May. Trash was noted on three surveys. Leaf debris was noted in August, September and November. A filmy water surface and air bubbles were also noted in November. No odors were noted during 2014.

Water depth ranged from 0.14 meter in August to 0.25 meter in April. Transparency ranged from 52.0 centimeters in December to ≥ 120.0 centimeters on most surveys. The median transparency for 2014 was ≥ 120.0 centimeters. All measurements of pH were within the 6.0 - 9.0 units state standard. Surface temperatures ranged from 3.0 to 25.0°C and were normal for the time of the year. No temperature measurement in exceeded the state standard of 32.0°C. All dissolved oxygen concentrations (annual median of 7.8 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Overall observations made during 2014 at this station were suggestive of good water quality.

Station ID: 48

Site: Tributary to Powwhite Creek at Brighton Green Community Association

Latitude: 37.5045

Longitude: -77.5584

Watershed: James River

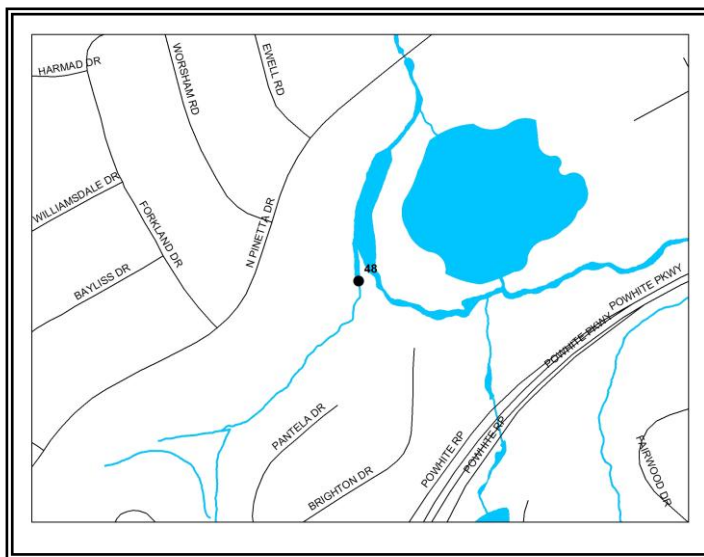
Land use: Residential

Number of Stations: 1

Volunteer Hours: 10.35

Number of Monitors: 1

Monitoring since: March 2014



This site is located on an unnamed tributary to Powwhite Creek in the northeastern area of Chesterfield. Stream measurements and water samples were obtained once or twice per month from March through December. No surveys were conducted in May or July. Nine surveys were conducted in 2014.

Table 1-29. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
March	1	18.0	14.0	8.9	7.0	64.0	0.8
April	1	20.0	16.0	5.7	6.0	8.0	*
June	2	25.5	23.0	5.2	7.0	115.5	0.7
August	1	26.0	24.0	5.5	7.0	115.0	0.5
September	1	18.0	19.0	4.8	7.0	69.0	0.6
October	1	21.0	18.0	4.7	7.0	110.0	*
November	1	11.0	10.0	6.7	7.0	109.0	*
December	1	7.0	3.0	9.2	7.0	110.0	*
Minimum		7.0	3.0	4.7	6.0	8.0	*
Median		19.0	17.0	5.6	7.0	109.5	*
Maximum		26.0	24.0	9.2	7.0	115.5	*

Surveys were conducted at this site nine times in 2014. Five surveys occurred on partly cloudy or overcast days. Three surveys occurred on rainy days. One survey occurred on a sunny/clear day. Normal baseflow conditions were recorded on eight surveys. High flows were noted in April. Water coloration was described as light brown during on six surveys. Clear conditions were noted in June and August and turbid conditions were noted in April. Leaves and debris were noted in April concurrent with high flows and turbid conditions. No odors were noted in 2014.

Water depth was measured irregularly at this site in 2014. The depth ranged from 0.61 meter to 0.81 meter. Transparency ranged from 8.0 centimeters in April to 115.5 centimeters in June. The median transparency value for 2014 was 109.5 centimeters. All pH measurements units were within the 6.0 - 9.0 units state standard. Surface

temperatures ranged from 3.0 to 24.0°C and were normal for the time of the year. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All dissolved oxygen concentrations (annual median of 5.6 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of adequately oxygenated waters. Overall observations made during 2014 at this station were suggestive of good water quality.

Station ID: 49

Site: James River at Dutch Gap Conservation Area

Latitude: 37.3711

Longitude: -77.3627

Watershed: James River

Land use: Natural Area,

Riverine Wetland

Number of Stations: 1

Volunteer Hours: 8.5

Number of Monitors: 1

Monitoring since: September 2014



This site is located on a tidal lagoon of the James River in the Dutch Gap Conservation Area in the eastern portion of Chesterfield County. Stream measurements and water samples were obtained once per month from September through December. Four surveys were conducted in 2014.

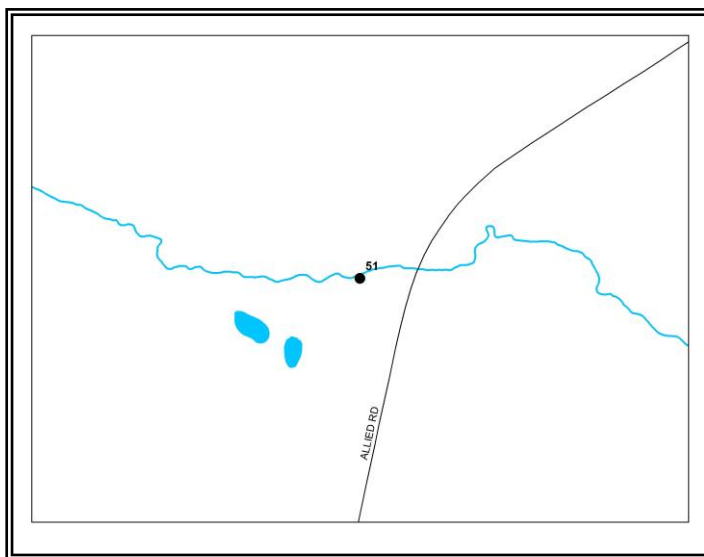
Table 1-30. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
September	1	22.5	26.5	5.9	7.5	54.2	*
October	1	19.0	21.0	7.3	7.0	39.0	*
November	1	2.0	16.0	8.4	7.5	52.0	*
December	1	12.0	9.5	9.4	7.0	82.0	*
Minimum		2.0	9.5	5.9	7.0	39.0	*
Median		15.5	18.5	7.9	7.3	53.1	*
Maximum		22.5	26.5	9.4	7.5	82.0	*

Surveys were conducted at this site four times in starting in September 2014. Three surveys occurred on clear/sunny days and one survey occurred on an overcast day. Water levels were not recorded regularly. Water coloration was described as; brown, light brown, turbid and milky sequentially. Pollen was noted in September and November. Leaves and debris were noted in December. No odors were noted in 2014.

Water depth was not measured at this site in 2014. Transparency ranged from 39.0 centimeters in October to 82.0 centimeters in June. The median transparency value for the monitoring period was 53.1 centimeters, indicative of marginal clarity. All pH measurements units were within the 6.0 - 9.0 units state standard. Surface temperatures ranged from 9.5 to 26.5°C and were normal for the time of the year. No temperature measurement in 2014 exceeded the state standard of 32.0°C. All dissolved oxygen concentrations (annual median of 7.9 mg/L) were above the state minimum standard of

4.0 mg/L and were indicative of well-oxygenated waters. Overall observations made during 2014 at this station were suggestive of good water quality.

Station ID: 51**Site:** Shand Creek at Allied Road**Latitude:** 37.3367**Longitude:** -77.3034**Watershed:** James River**Land use:** Residential,
Industrial, Forest**Number of Stations:** 1**Volunteer Hours:** 2.25**Number of Monitors:** 1**Monitoring since:** October 2014

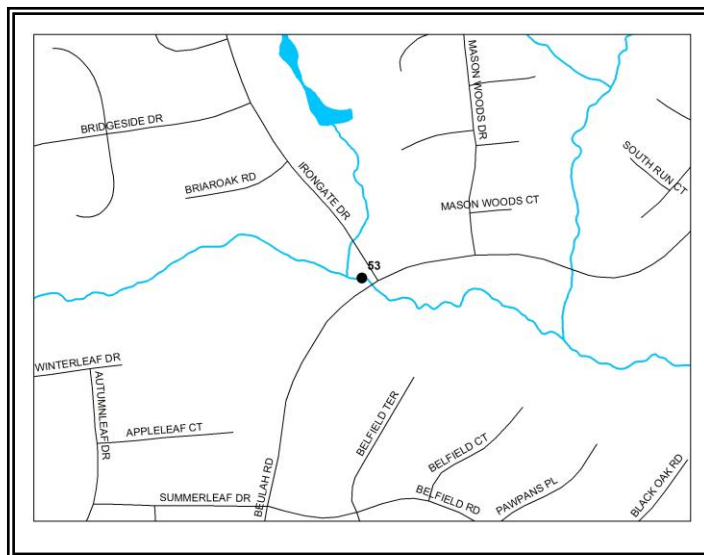
This site is located on Shand Creek near its crossing with Allied Road in the eastern portion of Chesterfield County. Stream measurements and water samples were obtained once or per month from October through December. Three surveys were conducted in 2014.

Table 1-31. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
October	1	17.0	14.0	7.8	7.0	81.2	
November	1	14.5	7.5	9.9	7.0	24.8	0.2
December	1	15.5	6.0	12.3	7.0	24.3	0.3
	Minimum	14.5	6.0	7.8	7.0	24.3	0.2
	Median	15.5	7.5	9.9	7.0	24.8	0.2
	Maximum	17.0	14.0	12.3	7.0	81.2	0.3

Surveys were conducted at this site three times in starting in October 2014. Each survey occurred on a clear/sunny day. Water levels were not recorded regularly. Water coloration was described as light brown on each survey. Leaves and debris were noted on each survey. An earthy odor was noted in each survey.

Transparency ranged from 24.3 centimeters in December to 81.2 centimeters in October. The median transparency value for the monitoring period was 24.8 centimeters, indicative of poor clarity. All pH measurements units were within the 6.0 - 9.0 units state standard. Surface temperatures ranged from 6.0 to 26.5°C and were normal for the time of the year. No temperature measurement in exceeded the state standard of 32.0°C. All dissolved oxygen concentrations (annual median of 9.9 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Overall observations made during 2014 at this station were suggestive of good water quality.

Station ID: 53**Site:** Kingsland Creek at Beulah Road**Latitude:** 37.4188**Longitude:** -77.4826**Watershed:** James River**Land use:** Residential**Number of Stations:** 1**Volunteer Hours:** 2.0**Number of Monitors:** 1**Monitoring since:** November 2014

This site is located on Kingsland Creek near its crossing with Beulah Road in the north, central portion of Chesterfield County. Stream measurements and water samples were obtained once or per month from November through December. Two surveys were conducted in 2014.

Table 1-32. Monthly values and annual medians for each water quality parameter measured during 2014.

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Transparency (cm)	Water Depth (m)
November	1	10.0	6.0	10.0	7.0	≥120.0	*
December	1	12.0	7.5	10.0	6.5	≥120.0	*
	Minimum	10.0	6.0	10.0	6.5	≥120.0	*
	Median	11.0	6.8	10.0	6.8	≥120.0	*
	Maximum	12.0	7.5	10.0	7.0	≥120.0	*

Surveys were conducted at this site two times in starting in November 2014. Each survey occurred on a clear/sunny day. Low flows were recorded each time. Water coloration was described as dark brown in November and clear in December. Leaves were noted on each survey. No odors were noted in either survey.

Transparency was measured as ≥120.0 centimeters on each survey. Both pH measurements units were within the 6.0 - 9.0 units state standard. Surface temperatures ranged from 6.0 to 7.5°C and were normal for the time of the year. No temperature measurement in exceeded the state standard of 32.0°C. Both dissolved oxygen concentrations (10.0 mg/L) were above the state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Initial observations made during 2014 at this station were suggestive of good water quality.

Station ID: 56

Site: Tributary to Swift Creek at
Glebe Point Road

Latitude: 37.3187

Longitude: -77.4869

Watershed: Swift Creek

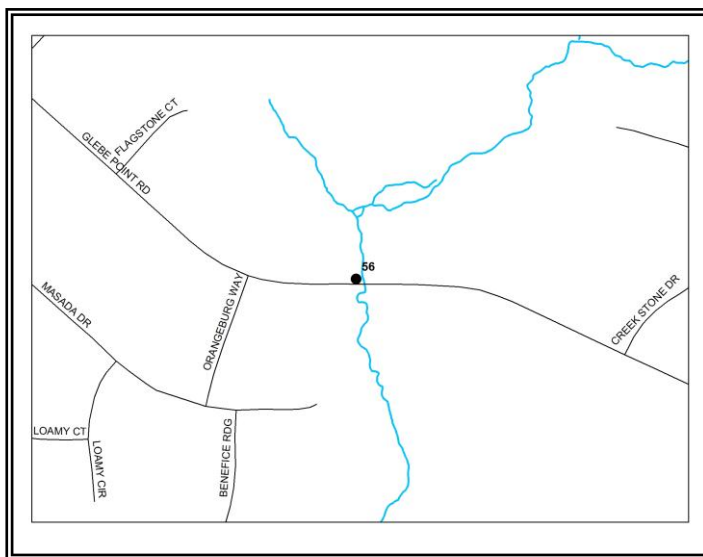
Land use: Residential

Number of Stations: 1

Volunteer Hours: 2.0

Number of Monitors: 1

Monitoring since: November
2014



This site is located on a tributary to Swift Creek in the central portion of Chesterfield County. Stream measurements and water samples were obtained once in November of 2014.

Table 1-33. Monthly values for each water quality parameter measured during 2014.

<u>Date</u>	<u>n</u>	<u>Air Temperature</u> (°C)	<u>Surface</u> (°C)	<u>Dissolved</u> (mg/L)	<u>pH</u>	<u>Transparency</u> (cm)	<u>Water Depth</u> (m)
November	1	12.2	7.0	10.7	6.0	≥120.0	*

Monitoring began at this site in November 2014. The survey occurred on a clear/sunny day. Normal flows were recorded. Water coloration was described as clear to light brown. Leaves were noted and an earthy odor was recorded.

Transparency was measured as ≥120.0 centimeters on the survey. The pH measurement (6.0 units) was within the 6.0 - 9.0 units state standard. The surface temperature was 7.0°C and normal for the time of the year. The dissolved oxygen concentration of 10.7 mg/L was above the state minimum standard of 4.0 mg/L and was indicative of well-oxygenated waters. Initial observations made during 2014 at this station were suggestive of good water quality.

Station ID: 200A & 200C

Lake: Walton Lake

Surface Acreage: 26

Latitude: 37.4772

Longitude: 77.6325

Watershed: Falling Creek

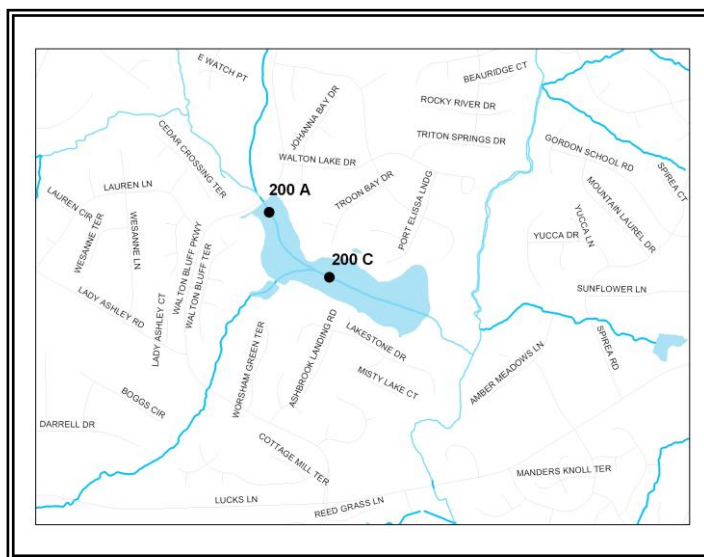
Land use: Residential

Number of Stations: 2

Number of Monitors: 1

Volunteer Hours: 24.0

Monitoring since: Spring 2004



Walton Lake is a manmade waterbody that was constructed and used as an amenity for the Isaac Walton League Hunt Club until the mid 1980s. The current dam was built in 1988 with the establishment of the Walton Lake subdivision. Homes surround the entire lake with the majority of the lakeside buffer as residential lawn. Residents utilize the lake for recreation such as boating and fishing. The lake's watershed is heavily developed with both residential and commercial properties. This year marked the ninth consecutive season of sampling since monitoring was temporarily suspended in 2005.

Table 1-34. Monthly and annual median values for each water quality parameter measured at two locations on Walton Lake 2014. (Where n=4 indicates two samples at two sites taken in the same month and values are represented as the median.)

Date	n	Air Temperature (°C)	Surface (°C)	Dissolved (mg/L)	pH	Secchi Depth (m)	Water Depth (m)	E. Coli (CFU/100ml)
April	2	20.0	17.5	8.4	7.0	0.8	2.0	<20
May	2	23.0	23.0	7.8	7.0	0.8	1.9	<20
June	2	25.5	26.0	6.2	7.0	0.4	1.9	<20
July	2	27.0	27.5	*	9.0	0.3	2.0	<20
August	4	27.0	27.0	4.8	7.0	0.8	1.9	<20
October	2	29.9	21.0	7.6	7.0	0.7	1.8	<20
Minimum		20.0	17.5	4.8	7.0	0.3	1.8	<20
Median		26.3	24.5	7.6	7.0	0.7	1.9	<20
Maximum		29.9	27.5	8.4	9.0	0.8	2.0	<20
2013 Annual Median		26.0	25.5	8.8	7.0	1.9	0.7	<20
2012 Annual Median		27.5	25.0	9.3	7.0	0.6	1.9	<20
2011 Annual Median		25.0	23.8	8.1	7.0	0.7	1.9	*
2010 Annual Median		30.0	26.0	5.1	7.5	0.7	1.2	*
2009 Annual Median		25.0	25.0	3.5	7.0	0.8	1.4	*
2008 Annual Median		23.0	22.0	4.1	7.0	0.8	1.3	*
2007 Annual Median		26.0	28.0	4.6	6.0	0.7	1.4	*
2006 Annual Median		23.0	24.0	*	6.0	0.8	1.4	*
2005 Annual Median		*	*	*	*	*	*	*
2004 Annual Median		23.0	28.0	*	5.5	1.0	1.3	*

Sampling at Walton Lake was conducted once or twice per month at two sites from April through October totaling 16 surveys. All surveys were conducted on partly cloudy days except the August 25, 2014 surveys, which noted clear/sunny conditions. The water surface was described as having ripples present on most surveys. The June and July surveys noted the water surface as calm. Water coloration was recorded as light brown during most of the monitoring period. A green color was noted in April and turbid,

yellow/green conditions were noted in July. An earthy odor was also noted in July. A blue/green algae bloom was noted in July. In August, the algae were gone and a sharp decrease in dissolved oxygen was noted, characteristic of eutrophic conditions.

The annual median water depth for the monitoring stations on Walton Lake was 1.90 meters, an increase from the 2013 median of 0.71 meters. Monthly median pH values during the year (annual median 7.0 units) for all sites were all within the 6.0 - 9.0 units state standard range and were similar to previously reported values. The median pH in July was 9.0, characteristic of eutrophic conditions. Monthly median surface temperatures ranged from 17.5 to 27.5°C and varied normally with season. As in past years, all individual site temperature values were at or below the state standard of 32.0°C during 2014. All dissolved oxygen concentrations (annual median 7.6 mg/L) were above state minimum standard of 4.0 mg/L and were indicative of well-oxygenated waters. Sixteen *E. coli* measurements were made at this site during the growing season. Samples were incubated for 48 hours at 26°C. All *E. coli* tests measured <20 CFU/100ml and therefore did not violate the state bacterial standard 235 CFU/100ml for recreational contact in 2014.

Transparency measured by Secchi disk ranged from 0.30 meters to 0.79 meters with an annual median of 0.73 meters. The annual median Trophic State Index value of 64 was slightly lower than the 2013 median of 65 but continued to suggest that Walton Lake is a biologically productive and mildly eutrophic body of water. Trophic State Index Values of 74 in June and 77 in July were suggestive of hypereutrophic conditions (index values >70) during the summer. As mentioned in previous reports, further observation of Walton Lake with particular emphasis on the visual assessment of aquatic plant growth is warranted. All of the observations at this station continued to suggest good water quality within this biologically productive lake.

Discussion

Regular measurements of water quality were made by volunteers at thirty-four stream and river stations and at two lake stations in Chesterfield County. During 2014, there were 335 individual site visits conducted by 37 volunteer monitors, representing a total of 479.1 hours of effort. A summary of these measurements' annual median values is presented below in Table 2-1.

Table 2-1. Annual median values of measurements made among all Chesterfield WaterTrends sites in 2014. *Denotes no sample taken **Denotes transparency measured in meters by Secchi disk. ***Denotes only one sample taken for each parameter.

Station	Air Temperature	Surface	Dissolved	pH	Transparency	Water Depth	E. coli (CFU/100ml)
James River at Robious Landing Park	20.3	16.3	7.9	7.0	78.5	*	*
Tributary to Falling Creek in Rockwood Park	18.5	18.0	6.1	6.5	102.0	0.5	*
Tributary to Falling Creek in Midlothian Mines Park	21.0	18.5	9.0	6.8	72.5	*	*
Swift Creek at Bailey Bridge Middle School	18.0	17.5	7.2	6.5	≥120.0	0.6	*
Spring Run at Birdsong Lane	16.5	15.8	8.3	7.0	≥120.0	*	160
James River at Enon	23.3	19.0	8.6	7.5	0.53**	1.9	45
Tributary to Powhite Creek at Bon Air Elementary School	16.5	12	8.1	6.5	≥120.0	0.8	40
Tributary to Powhite Creek at Poplar Hollow Trail	22.5	15	8.5	6.3	≥120.0	0.1	30
Johnson Creek at Kingston Avenue	20.6	16.6	7.4	6.0	76.0	0.3	*
Tributary to the James River at Old Gun Road	20.0	16.5	7.5	6.8	≥120.0	*	*
Winterpock Creek at River Road	16.0	15.5	7.0	6.5	62.0	*	40
Falling Creek at Belmont Road	23.0	15.5	6.2	6.5	107.5	1.0	*
Falling Creek at Kay Road	20.0	19.0	7.6	6.5	98.0	0.5	*
Horner's Run at Fernbrook Park	22.0	19.0	9.2	6.5	76.0	*	*
Great Branch at Chalkley Road	20.5	21.5	6.2	6.0	72.0	0.4	*
Marine Springs Branch At Kings Farm Drive	16.0	12.0	9.3	6.0	≥120.0	0.1	<20
Old Town Creek at Branders Bridge Road	18.0	13.0	9.7	6.0	47.0	*	*
Otterdale Branch at Lake Summer Place	20.0	13.8	8.0	6.5	110.2	*	*
West Branch at Prescott's Level	19.8	13.8	8.6	6.5	86.9	*	*
Tributary to Pocoshock Creek at A.M. Davis Elementary School	24.0	23.0	6.1	6.5	43.0	0.2	*
Tributary to Powhite Creek at Bloomfield Road	18.3	10.8	8.8	7.0	≥120.0	*	*
Second Branch at Nash Road	18.0	14.0	9.9	6.5	66.1	1.1	*
Swift Creek at Pocahontas State Park	19.5	18.0	6.1	6.5	85.0	*	*
Swift Creek Lake at Pocahontas State Park	28.0	26.0	6.9	7.0	59.8	*	*
Marine Springs Branch at Knights Run Drive	19.5	14.5	7.3	7.0	≥120.0	0.1	*
Tributary to Michaux Creek at Lastingham Drive	18.8	14.5	9.2	6.5	≥120.0	0.5	*
Appomattox River at Ettrick	22.9	16.2	8.2	7.0	115.4	*	*
Tributary to Falling Creek at Krossridge Road	21.0	15.5	7.8	6.5	≥120.0	0.2	*
Tributary to Powhite Creek at Brighton Green	19.0	17.0	5.6	7.0	109.5	*	*
James River at Dutch Gap Conservation Area	15.5	18.5	7.9	7.3	53.1	*	*
Shand Creek at Allied Road	15.5	7.5	9.9	7.0	24.8	0.2	*
Kingsland Creek at Beulah Road	11.0	6.8	10.0	6.8	≥120.0	*	*
Tributary to Swift Creek at Glebe Point	***	***	***	***	***	*	***
Walton Lake	26.3	24.5	7.6	7.0	0.73**	1.9	<20

All annual medians of pH, dissolved oxygen and surface water temperature met VA DEQ surface water standards during 2014. There were individual measurements at some sites that violated state water quality standards. A discussion of these violations is below.

pH

Observations of pH indicated that most measurements made during 2014 fell within the acceptable 6.0 to 9.0 units range specified by the VA DEQ. There were three reported violations of the state minimum standard for pH. No sites reported pH in excess of the maximum standard of 9.0 units in 2014. A summary of pH violations can be found in Table 2-2 below.

Table 2-2. Summary of pH measurements violating the VA DEQ 6.0-9.0 unit standard range.

Station	Date	pH
11, Tributary to Powhite Creek at Poplar Hollow Trail	4/30/2015	5.5
12, Johnson Creek at Kingston Avenue	3/31/15	5.5
	12/23/15	5.5

Station 11, a tributary to Powhite Creek, has no prior violations of pH since monitoring began there in 2010. The April 30, 2014 survey noted storms the day before and unusually high flows on the day of the sample. Substantially reduced clarity of 42.0 centimeters was also reported on the survey. The pH value and all other measurements returned to acceptable levels on subsequent surveys. The low pH on the April 30 survey may be attributable to runoff from the previous day's storm.

Site 12, Johnson Creek at Okuma Road, reported two violations of the state pH standard. These occurred in March and December. The remainder of pH measurements were within the acceptable range. Johnson Creek is currently listed as impaired for pH by VA DEQ.

Dissolved Oxygen

Dissolved oxygen concentrations indicated adequate to well-oxygenated waters at most sites during 2014. There were five surveys at two stations that did not meet the state minimum standard of 4.0 mg/L of oxygen. A summary of violations of state dissolved oxygen standards can be found in Table 2-3 below.

Station 4, Swift Creek at Bailey Bridge Middle School, had one dissolved oxygen violation in July. This site is generally well-oxygenated but does have a prior history of

occasional violations in summer months (July of 2010 and 2012). All monthly medians for the remainder of 2014 were within state standards.

Table 2-3. Individual instances of low dissolved oxygen (<4.0 mg/l) recorded among all monitoring stations during 2014.

Station	Date	Median DO
4, Swift Creek at Bailey Bridge Middle School	07/12/15	3.9
15, Winterpock Creek at River Road	07/03/15	3.2
	08/06/15	2.8
	09/03/15	2.4
	10/03/14	2.4
	10/31/14	1.8

Station 15, Winterpock Creek at River Road, had five violations of the state standard for dissolved oxygen. These observations were accompanied by elevated surface temperatures and reduced clarity. Winterpock Creek is listed as naturally impaired for dissolved oxygen by VA DEQ.

Temperature

Measurements of surface temperature at all sites varied normally according to season. There were no violations of the state standard of 32.0° Celsius in 2014.

Transparency

Water clarity was measured with a 120-centimeter turbidity tube (stream and river stations) or by a standard eight-inch Secchi disk at the James River near Enon Park and the Walton Lake stations. All readings and statistics discussed in this section are expressed as centimeters for comparison purposes. The greatest annual median transparencies of ≥ 120.0 centimeters were observed at eleven sites during 2014. This reporting year was the fourth consecutive year that excellent water clarity was observed at the Tributary to Powhite Creek at Bon Air Elementary School and at the Marine Springs Branch at Kings Farm Drive stations. Excellent water clarity was observed for the sixth consecutive year at the Swift Creek at the Bailey Bridge Road and Spring Run at Birdsong Lane reaches. The other stations where excellent clarity was present included the James River at Robious Landing Park, Marine Springs Branch at Knights Run Drive, Tributary to Michaux Creek at Lasingham Drive, Tributary to Powhite Creek at Poplar Hollow Drive, the Tributary to the James River at Old Gun Road and the Appomattox River in Ettrick, VA. Substantially reduced clarity was observed at the Old Town Creek

site on Branders Bridge Road where the annual median transparency was calculated as 47 centimeters.

E. coli

In 2014, *E. coli* monitoring using the Coliscan Easygel method was conducted at seven sites to characterize ambient bacteria levels. A total of 75 individual measurements at six and river stations and one lake site were made throughout the year. Samples were incubated at varying temperatures and times ranging from 24 hours at 35° C to 50 hours at 22° C depending on site and were all within the method procedure limits.

The monitoring period medians observed at these seven stations ranged from <20 CFU/100ml at multiple reaches to 620 CFU/100ml at Spring Run (Station 6). There were five individual measurements made at two sites that exceeded the 235 CFU/100ml VA DEQ bacterial standard for recreational contact. Station eight, the James River at Enon did not have any violations in 2014, an improvement over previous years. Station 6, Spring Run at Bird Song Road, reported four violations of the state standard. Station 10, Tributary to Powhite Creek at Bon Air Elementary School, reported one violation in July. A summary of *E. coli* tests violating state standards is found in Table 2-4 below.

Table 2-4. E. coli densities observed at three sites in 2014 exceeding VA DEQ recreational contact standard of 235 CFU/100ml.

Station	Date	E. coli cfu/100mL
6, Spring Run at Birdsong Lane	05/01/14	260
	08/06/14	620
	09/03/14	500
	10/03/14	480
10, Tributary to Powhite Creek at Bon Air Elementary	07/25/14	260

General Observations

Volunteers made visual observations of water quality and wildlife during each survey. Most surveys were conducted on clear/sunny days (51%) or partly cloudy or overcast days (44%). Showers or rain was present on four percent of the surveys. Weather was not noted on the remainder. Approximately 47% of visits were conducted during normal baseflow or calm conditions. There were 92 surveys (27%) that occurred during low flow conditions. This was an increase over the previous year when 15 percent of the surveys noted low flows and was indicative of a drier than normal year. High flows were noted 47 times accounting for 14 percent of the surveys, down from 24 percent in 2013. Flow conditions were not noted on the remainder of the surveys. A light to dark brown appearance was noted on 49% of the surveys. Clear water was reported on

approximately 37% of the surveys. Turbid conditions were noted on approximately 8% of the surveys. The remainder of the surveys reported a variety of appearances. Green conditions were noted eight times. Foam was reported seven times. As in past years, no perceptible odors were recorded on most surveys (90%). The most frequently reported odor was “earthy”, at approximately eight percent. A “fishy” odor was reported one time. A “rotten egg” odor was noted one time. As in past reports, the most common trash item continued to be litter and leaves/debris in the fall and winter. Additionally, algae and pollen were frequently noted on the water surface or within the water column at several sites during 2014. A variety of wildlife was observed during the year to include aquatic insects, fish, frogs, turtles, songbirds and waterfowl.

Future Goals

The Chesterfield WaterTrends program will continue to grow with an emphasis on maintaining current sites, expanding monitoring coverage, improving communication with monitors and broadening the suite of testing parameters. The WaterTrends program will be supported with the aid of a 2015 VA DEQ Citizen Water Quality Monitoring Grant. The grant will support training, purchasing of equipment and the printing of the Chesterfield WaterTrends annual report.

In 2015, Chesterfield WaterTrends will continue to expand its bacterial monitoring and macroinvertebrate monitoring using the Virginia Save Our Streams Rocky Bottom Method. The program will continue to add bacterial sites with an emphasis on areas with known impairments.

Chesterfield County WaterTrends Monitors

Much thanks and appreciation is given for the selfless volunteers who brave the elements to acquire data that assists in the protection of Chesterfield County's waters. Their stewardship is commendable.

Station 1	The Isman Family
Station 2	Elmer DeLa Cruz
Station 3	Tom Schlosser
Station 4	Joe Roussos, Cameron and Harrison Wells
Station 6	Tom and Gretchen Cole
Station 8	Jim Turner
Station 10	C.E. Pond
Station 11	Joel and Margie Dexter
Station 12	Norah Fink
Station 14	Tom Schlosser
Station 15	Tom & Gretchen Cole
Station 18	John Vance
Station 19	J. Haviland and T. Jenkins
Station 21	K.D. Tuley
Station 25	Rich Marino
Station 26	Diane Lewis
Stations 28	The Kester Family
Stations 29 & 30	The Hagan Family & Mathew Carey
Station 31	Dotty Rilee
Station 32	Lori Dzieiek
Station 34	Katy Dacey
Station 35	Tim Glover
Station 35.1	Tim Glover & Mathew Harvey
Station 36	Stephanie Jutz
Station 37	Tyrone Murray
Station 46	Yolanda Robinson
Station 47	Lisa Thompson
Station 48	Jeremy Zimmer
Station 49	Jim McCord
Station 51	Mojdeh Karimi
Station 53	Ben Hedges
Station 56	Jennifer Ambs
Station 200	Dr. John Burmeister